Volume 25 • Issue 8 • December 2019 (Supplement)

Selected abstracts presented at the XVIII Symposium of the International Society of Oncology Pharmacy Practitioners October 10–13, 2019, London, UK

JOURNAL OF ONCOLOGY PHARMACY PRACTICE

journals.sagepub.com/home/opp
ISSN: 1078-1552

Volume 25 Number 8(Supplement) December 2019

JOURNAL OF ONCOLOGY PHARMACY PRACTICE

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JOURNAL OF
ONCOLOGY
PHARMACY
PRACTICE

J Oncol Pharm Practice
2019, Vol. 25 8(Supplement) 1–116

DOI: 10.1177/1078155219871150
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Abstracts

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001

Real-world clinical outcomes in metastatic breast cancer patients treated with palbociclib

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Objective/purpose: Palbociclib has been shown to prolong the time patients live without their disease getting worse by an average of 6 to 10 months. The median duration of palbociclib treatment across the pooled dataset of three randomised studies was 12.7 months (381 days). Palbociclib is available as capsules (75, 100, 125 mg). The recommended dose is 125 mg once a day for 21 consecutive days, followed by a seven-day break to complete a 28-day treatment cycle. Treatment should continue for as long as the patient is benefitting from it and side effects are tolerable. If the patient experiences side effects, treatment may need to be interrupted or stopped, or the dose reduced. Time to treatment discontinuation (TTD) is a pragmatic endpoint easy to calculate for hospital pharmacists. TTD has recently been closely associated with progression-free survival. We examined this endpoint together with adherence and costs.

Study design/methods: This is a retrospective observational analysis of data derived from electronic health records. Female patients receiving palbociclib to treat hormone receptor-positive (HER2)-negative locally advanced or metastatic breast cancer after January 2017 were followed through 28 February 2019. The median value and a Kaplan-Meier analysis were employed as measures of TTD. Therapies of patients without any medication delivery in the last 84 days (three months) of the observation period were considered discontinued. Patients without a permanent discontinuation were censored. Data from three hospital centers (IFO Rome, Ivrea and Pescara – Italy) were used to examine TTD, adherence, days without therapy (DWT) and dosage modifications. Adherence is calculated by dividing the daily dose received by each patient by the daily dose prescribed, so values of adherence are included between 0 (no drug is administered) and 1 (optimum, in which quantities of prescribed and received drug are identical). Based on timing of drug delivery, DWT were defined as the number of days the patient was without capsules of palbociclib and could not take his therapy.

Results/key findings: A total of 163 patients were studied. The mean age at initiation of palbociclib was 62 years ($\pm$12.6) with 57% (n = 93) patients <65 years of age and 43% (n = 70) $\geq$ 65. Overall median TTD was 240 days (CI 27.4; 459.3). Dose modification, calculated as events per person/year, was 0.44. No age-related differences were found in median TTD. The mean rate of adherence was 0.85 (SD = 0.13). Mean adherence was 0.96, 0.89 and 0.81 for patients with TTD up to 84, from 84 to 168 and over 168 days, respectively. The mean DWT period for patient was 25.3 days. Total cost of therapy for the entire period was 1,997,820 euros (based on national healthcare price), with a mean cost of 61.08 euros/day.

Conclusion/recommendations: Understanding palbociclib utilization in real-world patients and knowing how drug dosing and monitoring are performed aids in granting a safe and effective use of the drug. The duration of palbociclib treatment in real-world clinical practice (8.6 months) does not completely match up with the results of randomized studies. Duration of treatment seems to decrease rate of adherence. In depth-studies are needed.

002

Cyto-SAT: A self-assessment tool for safe handling of cytotoxic medicines in low- and middle-income countries

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Objective/purpose: Handling cytotoxic medicines (CM) is a high-risk process for human and environmental health. Unsafe handling practices have been pointed out, particularly in countries where access and use of CM have recently increased. With the rising burden of cancer and the increased use of chemotherapy treatments in low- and middle-income countries (LMIC), promoting safe handling of cytotoxic drugs is of utmost importance.

Objectives: Develop, validate and pilot-test a self-assessment tool of the cytotoxic process for healthcare services in LMIC in order to support the implementation of safe handling practices and promote continuous quality improvement.

Study design/methods

First step: Development and validation of Cyto-SAT: A two-round Delphi survey was used to generate a consensual validation and prioritization of items addressing safety and quality aspects at every step of the cytotoxic process. The draft checklist built by a steering committee of experts was submitted to a panel of pharmaceutical experts in oncology pharmacy using an online self-administered questionnaire (Surveymonkey® software). Level of agreement using a five-point Likert scale and prioritization using a 1–3 ranking scale (1 = essential 2 = very important 3 = desirable) were evaluated. The validation rule was defined as ≥65% of agreement on the first round and ≥75% of agreement on the second round.

Second step: Pilot-test of Cyto-SAT: The Cyto-SAT tool was pilot-tested using an online survey in healthcare facilities from LMIC dealing with parenteral cytotoxic medicines. Participant facilities were asked to use Cyto-SAT to perform a self-assessment of their cytotoxic process and to fill in an evaluation questionnaire to give feedback on the tool regarding its usefulness, applicability, usability and acceptability. An internet-based platform was used to record the data (http://datapharma.ch/cytoSAT/).

Results/key findings

First step: Development and validation of Cyto-SAT: Twenty-seven experts (out of 55 contacted) from 13 countries (Algeria, Belgium, Canada, Chile, Egypt, Estonia, France, Germany, Morocco, New Zealand, South Africa, Switzerland, and Tunisia), including both high and LMIC (14 and 13 experts, respectively) completed the two rounds of the Delphi survey. At the end of the two rounds, 134/137 (97.8%) items reached final experts' consensus (≥75% level of agreement). Fifty-two of 134 (38.8%) items obtained a consensus regarding their priority rank (i.e. where ≥75% of the experts "agree" or "totally agree" with the median score of the priority obtained in the first round).

Second step: Evaluation of Cyto-SAT by intended users: Thirty-four institutions from 28 LMIC completed the evaluation questionnaire (out of the 51 who tested Cyto-SAT). Ninety-six percent of them reported total agreement or agreement with its usefulness, 94% with its applicability, 98% with its usability, and 97% with its acceptability.

Conclusion/recommendations: Cyto-SAT is the first assessment tool that addresses all the steps of the cytotoxic medicines handling process within a healthcare facility, targeting LMIC and validated through a Delphi consensus method involving experts from high-income as well as resource-constrained settings. The high level of satisfaction reported by intended users confirmed its quality as an ongoing quality improvement tool and might participate in enhancing future acceptability and use of this tool by resource-constrained settings.

003

Global effort required to increase the evidence base for outpatient oncology clinical pharmacy services

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Objective/purpose: Patients receiving anticancer therapies are frequently prescribed complex and high-risk medication regimens with potential for medication misadventures. Oncology clinical

pharmacy services are well established for inpatient settings across many jurisdictions. The optimal model for outpatient clinical pharmacy services is less clear. The objective of this review was to evaluate the evidence base supporting models and outcomes of care for outpatient clinic pharmacy services in the oncology setting.

Study design/methods: A systematic review of publications indexed in EMBASE, MEDLINE and Cochrane Library from June 2007 to June 2017 reporting medication-related outcomes among patients receiving outpatient clinic pharmacy interventions. Included studies were required to meet the following criteria: (i) original full-text article; (ii) evaluated an outpatient clinic pharmacy service; (iii) adult population with a cancer diagnosis; (iv) reported at least one change-over-time quantitative outcome measure; (v) reported at least one medication-related outcome measure; (vi) study design meeting at least criteria for grade III level of evidence according to the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) system. Two authors independently reviewed full-text articles for inclusion, then extracted data and performed quality and risk of bias assessments.

Results/key findings: Of 908 identified publications, excluding duplicates ($n = 314$) and non-cancer trials ($n = 435$), 159 were reviewed by title and abstract. Of these, 136 did not meet eligibility criteria, leaving 23 full-text articles for full review. Many excluded studies described outpatient pharmacy services but lacked medication-related outcomes. Overall, 13 studies met full eligibility criteria including one RCT, two cohort studies with control groups, and 10 uncontrolled before–after studies. All included studies had informative practice model designs, with interventions for drug-related problems (DRPs) including drug dose optimisation ($n = 8$), reduced drug interaction ($n = 6$) and adverse drug reaction reporting ($n = 3$). Most studies ($n = 11$) reported on symptom improvement: commonly nausea ($n = 7$) and pain ($n = 5$). Studies of radiotherapy clinics ($n = 4$) reported on pharmacist interventions for analgesics including recommendation for new opioid therapy, dose adjustment and monitoring of toxicities. Other key findings include reported improvement in medication adherence and reduced symptom scores correlating with better management of treatment-related toxicities.

Conclusion/recommendations: Few studies have objectively assessed outpatient cancer pharmacy services, even fewer in the radiotherapy setting. Although results support these services, significant heterogeneity and bias in study designs prohibit robust conclusions. Services aimed at improving medication adherence and prescribing patterns are likely to be most beneficial to cancer outpatients. Conducting robust studies will enable implementation of evidence-based models of care which improve patient outcomes and contribute to the global advancement of pharmacy practice.

004

A randomised controlled trial to assess the impact of a structured outpatient pharmacy service on medication adherence in patients undergoing chemoradiation

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Objective/purpose: Medication non-adherence and low self-efficacy with prescribed medications are significant barriers to the success of cancer treatments in the outpatient setting. Outpatient pharmacy services can potentially improve patients' understanding of their medications and improve medication adherence, translating into better patient health outcomes. However, there is limited evidence to define the optimal service delivery model and gauge the full impact of these services.

Study design/methods: A randomised controlled trial to assess the effectiveness of an outpatient clinical pharmacy service on health outcomes of patients treated with definitive chemo-radiotherapy for head and neck cancers. The intervention entailed delivery of a structured Pharmaceutical Care Program, developed internally based on best practice evidence, consumer input and literature search. The program incorporated regular one-on-one education sessions, development and supply of medication adherence aids, supplementary education material, best possible medication history, identification of drug-related problems and clinical recommendations to the clinician group. The primary endpoint was medication adherence as assessed by validated tools (1) Medication Understanding and Use Self-Efficacy (MUSE) scale and (2) the Teach-Back technique (pharmacist objective assessment of patient adherence). Secondary endpoint was patient-reported symptoms assessed by the Edmonton Symptom

Assessment Scale (ESAS). Increased scores reflected increased understanding, adherence and symptom burden. Assessments were conducted at baseline (weeks 1–2) and towards the end of radiotherapy (weeks 5–7). In this preliminary analysis, two-sample t-tests were used to assess differences in adherence and symptom scores between arms and time points. Adjustment for confounders will be considered in final analyses.

Results/key findings: At this interim analysis, 88 of a planned 100 patients were recruited, of which 45 were randomised to the intervention arm and 43 to the control arm. Median age was 60 years (range 22–87), 77 were male (87.5%) and 50 received chemoradiation (56.8%) whereas 38 received single modality radiotherapy (43.2%). Randomisation between arms was balanced for key confounders: age; sex; cancer staging; chemotherapy protocols and radiotherapy intensity. A total of 176 patient assessment interviews and 180 episodes of pharmacist–patient education sessions were conducted. Medication use and complexity increased dramatically from baseline to follow-up, with polypharmacy ($\geq$5 medications) observed in 26% of patients at baseline which subsequently rose to 97% on follow-up. Mean changes in the MUSE scale, between baseline and follow-up, were -0.38 points (95% CI (-1.52, 0.76), $P = 0.518$) in the intervention arm and -2.3 points (95% CI (-4.03, -0.58), $P = 0.012$) in the control arm. Mean changes in the Teach-Back scale were $+0.83$ points (95% CI ($+0.56$, $+1.09$), $P < 0.001$) in the intervention arm and $+0.23$ points (95% CI (-0.05, $+0.50$), $P = 0.111$) in the control arm. Compared to the control, the intervention arm had a greater increase in Teach-Back scores ($P = 0.003$) and lower reduction in MUSE scores ($P = 0.072$), reflective of greater medication adherence. The intervention arm reported lower bowel symptoms on the ESAS scale ($P = 0.029$); however, differences in pain ($P = 0.652$) and nausea scores ($P = 0.798$) were not statistically significant.

Conclusion/recommendations: A structured outpatient clinic pharmacy service, incorporating a proactive education program, improved medication adherence. Interim results suggest potential improvement in patient medication understanding and management of treatment-related symptoms.

Concurrent Session: Research 2

005

Antineoplastic treatment and cognitive impairment among adolescent and young adult cancer patients

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Objective/purpose: Cognitive skills are important to adolescent and young adult (AYA) cancer survivors (aged 16 to 39 years) who are likely to return to work or school after cancer treatment. However, cancer-related cognitive impairment (CRCI) is poorly studied in this population. Therefore, we evaluated the trends of CRCI and associated factors in a cohort of AYA cancer patients undergoing antineoplastic treatment.

Study design/methods: This was a longitudinal cohort study conducted at the National Cancer Centre Singapore. Cancer patients between 16 and 39 years old were recruited at their first medical oncology visit and followed up on up to 3 time points over a one-year period. Cognitive complaints were measured using the patient-reported outcome measure Functional Assessment of Cancer Therapy–Cognitive Function Instrument (FACT–Cog). Symptom burden was assessed using the Rotterdam Symptom Checklist. Patients were classified as having CRCI using a previous established minimal clinically important difference of FACT-Cog. Mixed-effects model analysis was conducted to identify factors that are associated with poor cognitive function, including different antineoplastic treatment modalities.

Results/key findings: A total of 102 participants completed evaluation of cognitive function at baseline with a mean age of 28.6 (SD: 6.9) years old. The majority of participants were diagnosed with sarcoma (38.2%), followed by lymphoma (29.4%), germ cell tumor (11.8%), neurological tumors (10.8%) and other malignancies (9.8%). The treatment modalities that the participants received included cytotoxic chemotherapy (57.8%), surgery (48.0%) and radiotherapy (29.4%). Overall, 31.4% of participants reported CRCI at least once among all follow-up time points. Cytotoxic chemotherapy ($p = 0.62$), radiotherapy ($p = 0.15$) and surgery ($p = 0.86$), were not significantly associated with

cognitive function. However, female gender ($p = 0.02$), ethnicity ($p < 0.01$), a history of smoking ($p < 0.01$), presence of anxiety/depressive symptoms ($p < 0.01$) and fatigue ($p < 0.01$) were found to be predictors of poor cognitive function.

Conclusion/recommendations: Despite their young age, approximately one-third of cancer patients within the AYA age group report of experiencing significant cognitive decline at one or more time points over a one-year period. Given the importance of cognitive skills in this patient population, improved awareness and management strategies to address it are imperative.

Funding: This work was supported by the National Medical Research Council Singapore (Grant number NMRC/CIRG/1471/2017).

006

Risk assessment of hyperglycaemia induced by steroid use for immunotherapy toxicity in non-small cell lung cancer (NSCLC) patients

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Objective/purpose: Despite important clinical benefits in NSCLC and other tumour types, immune checkpoint inhibitors (ICPis) are associated with an immune-related spectrum of side effects. High dose and prolonged courses of steroids are the mainstay of management. In addition to autoimmune destruction of beta cells by ICPis, high-dose steroids are associated with hyperglycaemia. Poor glycaemic control has been linked with poor cancer prognosis and reduced quality of life in observational studies.

Aims and objectives: The aim of this study is to determine if the risk assessment of hyperglycaemia induced by steroid use for immunotherapy toxicity in NSCLC patients is taking place according to clinical practice guidelines at the Trust and the Joint British Diabetes Societies (JBDS) guidelines.

Criteria and standards to compare against as derived from JBDS and local Trust guidelines:

1. Proportion with baseline HbA1c and/or glucose (BM) measured at steroid initiation – 90%
2. Proportion who had random glucose monitoring whilst on treatment – 90%
3. Proportion with assessment of risk of diabetes as per assessment criteria by JBDS – 90%

Study design/methods: Using electronic data records, a retrospective evaluation of NSCLC patients receiving ICPis (Pembrolizumab, Nivolumab, Atezolizumab, Ipilimumab, Durvalumab) over nine months (May 2018 to Jan 2019) was conducted. All patients who received steroids for the management of immune-related adverse events were included. Clinical trials were excluded.

- Expected sample size with immunotherapy toxicity requiring steroid management $n = 35$ (expected to obtain from 100 patients)
- Using 35 patients, expected proportion to meet target 90%, with 95% CI of (80–100%)

Results/key findings: There were 125 NSCLC patients treated with ICPis. 36/125 patients (29%; CI: 22–37%) received steroids at a dose of ≥ 10 mg prednisolone or equivalent for immunotherapy indications. This is a critical finding as it is in accordance with expectations from clinical practice and published literature.

Of those 36 patients:

- 8/36 (22%; CI: 12–38%) had both baseline HbA1c and glucose measured at steroid initiation (standard 1)
- 15/36 (44%; CI: 30–60%) had only baseline glucose measured at steroid initiation (standard 1)
- 23/36 (64%; CI: 48–78%) had blood glucose measured whilst on steroid treatment (standard 2), 18/23 of whom experienced a new grade 1 hyperglycaemia which may have required an intervention. Individualised targets should, however, be considered for patients with cancer and diabetes. Laboratory glucose measurements show that hyperglycaemia is taken into consideration in clinic reviews.

HbA1c was always measured alongside a baseline glucose level (standard 1). There was no risk assessment carried out using the JBDS assessment criteria (standard 3). Therefore, there was no identification of patients at higher risk.

Conclusion/recommendations: This is a baseline audit to practice. Findings highlight that current practice requires improvement and draws attention to this area. A major factor to consider is awareness to guidelines as the substantial increase in the

complexity of management in NSCLC in recent years has made this challenging.

Limitations: Data were retrospectively collected without considering the overall standard of the consultation.

Next steps:

- A local diabetes risk assessment tool will be developed.
- There will be further efforts in education and communication with a re-audit in six months' time.

007
Evaluation of training passport for oncology pharmacists across London

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Objective/purpose: In England, cancer networks were developed to support the delivery of integrated care pathways for a population across a geographical area. One such London cancer network, London Cancer Alliance (LCA), developed a training passport for oncology pharmacists in 2015. Over time, cancer networks evolved into Cancer Alliances. The Royal Marsden Partners (RMP) Medicines Optimisation (MO) Group sought to evaluate the current use of the training passport across London. This would inform the Pan-London uptake of a revised passport. It aims to standardise training and accreditation for pharmacists and to support transferability of skills across London. It was felt that a standardised training passport would assist with recruitment and retention of the oncology pharmacy workforce. The objective of this project sought to evaluate the uptake of the LCA passport and to inform future developments of the passport to encourage its adoption across London.

Study design/methods: A questionnaire was developed by members of the RMP MO group and distributed to all lead pharmacists working in cancer services within London during December 2018. The survey explored staffing complement and local training programmes. Open-ended questions established what resources would be useful for training and the contents of an ideal training passport. Data were captured on an Excel spreadsheet. Thematic analysis was used for the open-ended questions, and descriptive statistics was used for the rest of the questions. RMP MO group chair approved the project.

Results/key findings: Twenty-four responses across 15 organisations in London were completed. The majority (n = 14) of the organisations reported that the LCA passport was used to support training for SACT verification. The survey response showed that there are approximately 180 pharmacists who are currently responsible for SACT verification across London. Interestingly, one cancer centre reported having two pharmacy technicians who verify SACT. Overall, the majority of pharmacists working within cancer services were band 7 or above. Respondents reported that 80% (n = 12) of organisations used the majority of the sections of the passport, i.e. multiple choice questions, calculations, mock prescriptions and competency framework. All respondents made recommendations for further resources, e.g. British Oncology Pharmacy Association's learning modules. Suggestions for a future passport included more haematology mock prescriptions, separate section on oral SACT, examples of new immunotherapies and more introductory information on cancer. The majority (n = 14, 93%) of organisations would like the passport to be available as an electronic/online format.

Conclusion/recommendations: The survey showed that the existing passport is utilised across London; however, there is a clear need to update and enhance the contents. More haematology-focussed sample prescriptions, inclusion of immunotherapy examples and introductory information on cancer in general were suggested to improve the existing passport. The updated passport will be developed to allow the users to be able to tailor the training for individuals depending on the knowledge level of the learner. The feasibility of supporting an online version will be explored. If adopted, it is anticipated that the SACT verification accreditation will be transferable between organisations across London and indeed England.

008

Patient factors and their impact on neutropenic events: A systematic review and meta-analysis

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Objective/purpose: Neutropenia is associated with an increased risk of mortality and hospitalisation. Strategies, including the prescribing of colony-stimulating growth factors (CSFs), are adopted when a high risk (>20%) of neutropenic complications are seen in the clinical trial setting. This guide is used commonly within electronic prescribing systems in the UK to automate correct supportive care prescribing to high-risk patients. However, individual patient characteristics are often disregarded when assigning treatment risk and with a diverse treatment population that may differ from the patient groups recruited to studies, appropriate prescribing decisions by clinicians are essential. Anecdotally, hospitalisations have occurred when chemotherapy treatments are associated with a risk that is between 15 and 20%, meaning underuse of CSFs. Many observational studies have aimed to understand and quantify the associations between individual characteristics and neutropenic events. However, at present, results are conflicting making it difficult to make appropriate individualised treatment choices. In this systematic review and meta-analysis, we aimed to aggregate these associations of neutropenic events with patient characteristics to guide future management.

Study design/methods: A systematic review with a meta-analysis was conducted using The Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement. Studies were identified through a literature search using MEDLINE, EMBASE and Cumulative Index to Nursing and Allied Health Literature (CINAHL) databases from inception to 1 December 2017. Studies were included into a meta-analysis, using a random effects model, if they adjusted for confounders; analyses were conducted in STATA v 15.1 SE.

Results/key findings: A total of 4415 articles were retrieved by the search with 37 meeting the inclusion criteria and 12 eligible for meta-analysis. Many associations were found between NEs and patient factors such as age, co-morbidity and baseline blood levels. Interestingly, performance status and stage were not factors that were selected in the final analysis of many studies, as they showed weak associations. Due to the diversity of the studies, we could only conduct a meta-analysis of two patient factors: age and co-morbidity. For increasing age, we yielded a pooled odds ratio of 1:39 (1:11, 1:76, $I^2 = 24.1\%$), in our subgroup analysis of 4814 patients. Odds ratios for studies were pooled that reported associations for one co-morbidity compared to none and resulted in an overall odds of 1.54 (CI 1:09–2:09, $I^2 = 13.1\%$), including 9189 patients in total.

Conclusion/recommendations: We have demonstrated that where a risk of a chemotherapy regimen is 15% and a patient is over 65 with one co-morbidity, their risk of neutropenic events would actually rise to 30%. This work raises the awareness of personalisation of supportive care for patients when pre-programming and algorithms are prominent. Results can enhance current guidance in prescribing primary prophylaxis for treatments that either fall marginally under the internationally recognised 20% neutropenia risk.

Funding: The work was supported by a National Institute for Health Research award. PC is a Doctoral Research Fellow funded by the NIHR Academy (Project reference DRF 2017-10-016). The views expressed are those of the authors and are not necessarily those of the NHS, the NIHR or the Department of Health and Social Care.

009

Stability of cytarabine in an ambulatory infusion device

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Objective/purpose: The ambulatory care service within Cardiff and Vale University Health Board was established in 2017 to administer chemotherapy to patients at home rather than as traditional inpatients. The service aims to improve patient experience whilst creating a safe and efficient model for delivering care. Chemotherapeutic treatment was assessed for provision in cassettes to allow delivery via an ambulatory infusion pump with minimal risk

of spills. It is necessary to assure the stability of chosen chemotherapeutic agents in these cassettes, as they will be exposed to elevated temperatures for prolonged periods of time. The aim of this study was to assess the stability of cytarabine in the cassette at body temperature to allow ambulation of a number of patients on haematological malignancy and bone marrow transplantation treatment regimens.

Study design/methods: Stability studies were conducted by St Mary's Pharmaceutical Unit (SMPU) in conjunction with Cardiff University. CADD® cassettes containing cytarabine at a concentration of 20 mg/ml in water for injection were prepared aseptically. Initial studies undertaken by Cardiff University used a modified British Pharmacopoeia (BP) method for cytarabine injection to validate the analysis methodology and assess baseline stability. Subsequent studies at the SMPU focused on stability at 40°C/75% relative humidity at 0, 3 and 7 days using the BP cytarabine injection assay. Chemical stability was assessed by HPLC-UV and physical stability by pH, turbidity and visual assessments.

Results/key findings: HPLC-UV analysis indicated that cytarabine remained stable in the cassette when exposed to temperatures of 40°C/75% relative humidity for seven days. The mean drug concentration was 101.42% on day 0 ($n = 3$), 103.09% at day 3 ($n = 3$) and 105.00% at day 7 ($n = 3$) and therefore remained within the BP limits of 95–105% over the seven-day period. The slight increase in cytarabine concentration may suggest evaporative losses from the cassette, and further studies are needed to assess this. No degradation peaks were observed in the chromatograms at any time point. The pH of the samples were 8.21, 8.35 and 7.98 on day 0, 3 and 7, respectively, and therefore remained within the BP limits of 7.0–9.5. There was no increase in turbidity or evidence of precipitation of cytarabine in the cassette throughout the study period.

Conclusion/recommendations: The results of this initial study indicate that cytarabine, prepared under controlled aseptic conditions in CADD® cassettes at a concentration of 20 mg/ml in water for injection, is stable for seven days according to NHS QA Yellow Cover Document stability guidelines for ambulatory care. This new data will support the delivery of cytarabine-based regimens through an ambulatory care service, making the chemotherapy services more sustainable and enabling patients to receive care at home with greater independence and normality during treatment. Subsequent studies to assess stability of other chemotherapeutic agents will be undertaken to allow more regimens to be delivered in this innovative way.

Funding: Macmillan funded post as Ambulatory Care Pharmacist.

010

Cancer patient perspectives on community pharmacy diabetes screening service – A qualitative study of enablers and barriers

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Objective/purpose: To provide transitional care to cancer patients discharged from hospital on high-dose glucocorticoids (GC), a new program for community-based care was implemented. The program aimed to mitigate potential adverse effects associated with high-dose GC through early detection and intervention. It included community pharmacy referral for blood glucose level (BGL) monitoring and clinical pathways for escalation of medical care. As our first model of shared care between hospital and community pharmacy, we aimed to assess consumer-identified barriers and enablers to participation to inform improvements to better meet consumer needs.

Study design/methods: Between April 2018 and February 2019, we conducted semi-structured interviews with patients eligible for the BGL monitoring program. A convenience sample was recruited based on availability and agreement to participate in interviews until thematic saturation was reached. Interviews ranged from 10 to 40 min, were conducted by two trained study personnel, transcribed verbatim, de-identified and analysed using thematic analysis.

Results/key findings: In the recruitment period, 75% (114/153) of patients meeting program eligibility consented to participate. A subset of patients were invited and consented to participate in in-depth interviews. Thematic saturation was reached after

21 interviews including 15 (71%) patients who agreed and 6 (29%) patients who declined the program. Patient-reported enablers to program participation included positive recommendation by healthcare professionals, concerns for personal well-being, experience with diabetes or its complications (personal or through family members) and a motivation to assist in research and improvement of health services for the benefit of other patients. Patient-reported barriers to participation included distance to the pharmacy, transportation, dependence and burden on others and lower prioritisation relative to other health issues. Travel was particularly an issue for patients living in rural areas or relying on others for transport. Dependence and feelings of being burdensome to others were often linked to the impact of their cancer on activities of daily living, which meant they had limited mobility, were unable to drive, or unable to leave the home without assistance. Multiple cancer and health-related appointments resulted in lower priorities of monitoring BGL for patients, especially when the immediate risk of diabetes seemed low. Patients declining the program highlighted other ways of monitoring BGL such as buying a blood glucose meters and testing at home.

Conclusion/recommendations: Community-based services intend to relieve pressure on hospitals and provide patients with greater access to care. There is limited knowledge about the acceptability of such services in cancer patients within community pharmacy, and this qualitative study provides useful information to inform consumer-focused models of care. The study highlighted that while community pharmacy care was acceptable to most patients, barriers associated with transport and carer dependence suggest that alternate service models should be offered concurrently. Patients' decisions to participate in a community-based BGL monitoring program were based on individual balancing of risks of potential complications with perceived burden of monitoring. Findings may be applicable to other clinical services, in which multiple pathways of care can be offered to meet varied patient needs.

Posters

Clinical Science (CS)

011

Strategies for the successful implementation of pharmacist prescribing initiative in oncology practice

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Objective/purpose:

- To evaluate the feasibility of pharmacist prescribing in the oncology setting
- To identify potential obstacles to pharmacist prescribing
- To determine factors contributing to the success of the pharmacist prescribing initiative
- To review the initial uptake of medication prescribing by pharmacists

Study design/methods: Initiated in 2016, this prospective study consulted medical oncologists, general practitioners in oncology, nurse practitioners, nurse leaders, front-line physicians, nurses and pharmacists, in an accredited academic cancer centre in Canada, in order to capture the healthcare team's perspective on pharmacist prescribing. In addition, a thorough literature search on pharmacist prescribing was conducted, using a number of reliable medical databases, including PubMed, Medline and EMBASE, in order to determine the extent of experience with pharmacist prescribing in the oncology setting. Subsequently, a pharmacist prescribing policy was put together and forwarded to the key representatives from medicine, nursing and pharmacy for their review and input. One-on-one meetings were held to review and address any concerns about the pharmacist prescribing policy, and revisions were made to the policy accordingly. Once consensus on the scope of prescribing by the pharmacists was reached, the draft policy was submitted to the regional committee responsible for review. Upon approval, pharmacists were given the go ahead to prescribe medications within their scope of practice in the inpatient setting and to provide feedback to the project leader about their experiences.

Results/key findings: Pharmacist prescribing can be successfully implemented in a collaborative oncology setting. Obstacles to pharmacist prescribing include lack of confidence in the pharmacists' abilities to prescribe medications appropriately, the belief that physicians should primarily prescribe medications, lack of time to take on additional prescribing responsibilities by pharmacists, fear of being sued for inappropriate prescribing and lack of regulatory support for pharmacist prescribing in the community. Factors contributing to the successful implementation of the pharmacist prescribing initiative include receiving adequate support from the healthcare team, and advocacy for pharmacist prescribing from influential champions within teams, approval bodies, and the healthcare organization as a whole. Pharmacists can successfully prescribe if they complete a physical assessment course, in order to feel confident in their diagnostic techniques, develop expertise and experience in their practice fields, demonstrate their competence in prescribing medications and feel supported by their colleagues, leaders and work environment. Pharmacists may initially feel reluctant to prescribe medications, as this significantly expands their scope of practice and makes them more liable for their drug therapy decisions for patients. With timely coaching and reinforcement of the benefits of pharmacist prescribing and more experience in prescribing, it is expected that pharmacists will feel more confident and comfortable in their abilities to successfully prescribe medications in the oncology setting.

Conclusion/recommendations: Pharmacist prescribing is feasible within the oncology setting. Through proper consultation, buy-in for pharmacist prescribing can be obtained. With adequate support, coaching and reinforcement of the benefits of prescribing, pharmacists can feel empowered to practice at the top of their license, with the ultimate goal of improving patient health outcomes, improving patient safety and reducing healthcare costs, thorough safe and effective prescribing.

013

Cardiotoxicity and cardiac monitoring among anthracycline-treated cancer patients: A retrospective cohort study in Riyadh, Saudi Arabia

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Objective/purpose: Anthracyclines are potent antineoplastic agents with proven efficacy in the treatment of many hematologic and solid organ cancers. Cardiotoxicity is a known complication associated

with the use of anthracyclines. Limited data are available on both delayed and acute anthracycline-related cardiotoxicity and adherence to recommendations for cardiac monitoring in patients with cancer that are being treated with anthracyclines. Therefore, this study aims to determine the rate of anthracycline-related cardiotoxicity and to estimate adherence to recommendations for cardiac monitoring among anthracycline-treated cancer patients in Saudi Arabia.

Study design/methods: This study was a single-center retrospective cohort study on subjects with cancer, 18 years of age and older, receiving anthracyclines from the period of 2015 to 2018, in Riyadh, Saudi Arabia. We excluded Subjects with a previous diagnosis of any cardiovascular disease before using anthracyclines. Data on cancer stage and type, comorbidities, treatment details, monitoring parameters, and cardiovascular events were collected. The primary outcome was the rate of adherence to guideline recommendations for monitoring anthracyclines-related cardiotoxicity based on the American Society of Clinical Oncology (ASCO) clinical practice guidelines. The secondary outcome was the incidence of both acute and delayed anthracyclines-related cardiotoxicity. Statistical analysis included descriptive statistics and logistic regression. We received ethical approval from King Saud University institutional review board before the start of the study.

Results/key findings: In a total of 235 patients identified, 54.90% were male and 25.56% were above the age of 60. The most common type of cancer identified was lymphoma (56.23%). Majority of the study participants received doxorubicin (77.46%), about one third had radiotherapy, and the most frequently used biological therapy was rituximab (46.62%). Adherence to guideline recommendations was only achieved in 25.02% of the population. Echocardiography was the most common monitoring method used in study subjects. The incidence of cardiotoxicity was 28.92%, where 8.96% of them had delayed cardiotoxicity. Using multivariate regression analysis, subjects with diabetes had statistically significant higher odds of developing cardiotoxicity (OR = 2.06, 95% confidence interval (CI) = 1.02–4.09). On the other hand, those who received cardiac monitoring before starting anthracyclines had statistically significant lower odds of developing cardiotoxicity during treatment (OR = 0.49, 95% CI = 0.27–0.86). In only one-third of the study subjects who developed cardiotoxicities had optimal monitoring performed.

Conclusion/recommendations: In this study, there was poor compliance with cardiotoxicity-monitoring guidelines, which underscores the detection of early and delayed cardiotoxicity. We demonstrate that subjects with cancer and a history of diabetes have double the odds of developing cardiotoxicity, which suggests that intensive monitoring and prevention strategies are needed in these subjects. We also noticed that early cardiac monitoring could lower the chances of developing toxicity, which emphasizes the need for enforcing guideline recommendations. As the number of cancer patients is expected to rise worldwide, more patients are expected to develop cardiotoxicity overtime. Therefore, better tools for prediction and prevention of treatment-related cardiotoxicity are warranted.

014

What patient assessment skills are required by pharmacists prescribing systemic anti-cancer therapy? A consensus study

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Objective/purpose: In the UK, pharmacist independent prescribers (PIPs) can prescribe for any condition within their clinical competence including systemic anti-cancer therapy (SACT).[1] Competency frameworks have been developed but contain little detail on the patient assessment skills (PAS) PIPs require to prescribe SACT with concern in literature over current training on these skills.[2,3]

The aim of this project was to gain consensus on the PAS required by PIPs prescribing SACT for genitourinary (GU) cancer (prostate and renal) and lung cancer across NHS Scotland.

Study design/methods: Two phases were performed to generate PAS consensus. Initially, the Nominal Group Technique (NGT) was performed within a local cancer network by discussion and participant ranking within GU and lung cancer multi-disciplinary teams (MDTs). Where consensus was achieved, PAS were carried forward to try to achieve national (NHS Scotland) consensus using a two-round Delphi questionnaire.

Results/key findings: Of the 27 PAS, consensus was gained for 21 and 23 PAS in the GU and lung NGT

groups, respectively. Within the GU (n = 23) and lung (n = 18) national groups, 13/21 and 18/23 PAS were agreed as required for a PIP to prescribe SACT in GU and lung cancer, respectively. Eight common PAS were identified as core skills. Reasons for not reaching consensus included PIP competence, knowledge and skills, and the roles and responsibilities of PIPs within the MDT.

Conclusion/recommendations: We identified the core and specific PAS required to prescribe SACT within two tumour groups. Further work is necessary to develop PAS competency frameworks, training and assessment methods and to redefine the roles of PIPs within the MDT.

015

Assessing the impact of chemotherapy-induced nausea and vomiting on patients' quality of life: An Arabic version of the functional living index-emesis

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Objective/purpose: While nausea and vomiting associated with chemotherapy use can impact patient's quality of life, and therefore treatment adherence, we seek to develop a reliable and valid Arabic language version of the Functional Living Index-Emesis (FLIE), a validated patient-reported outcome measure designed to assess the influence of chemotherapy induced nausea and vomiting on patients' quality of life.

Study design/methods: A linguistic validation of Arabic language version was done. The validation consisted of four steps: First, forward translations conducted by two professional translators and a local coordinator. Both translators and the local coordinator reviewed translations. Second, backward translation by a professional translator who had no access to the original questionnaire. After that, a comparison of the backward version with the source instrument was done by a local coordinator. Third, cognitive interviews where the translated questionnaire was tested on targeted population through individual interviews. Finally, proofreading was done.

Results/key findings: Two independent translations were produced during the forward translation step. Multiple differences were identified between the translations. However, a reconciled pooled version was agreed on by both translators and the local coordinator. In the second step, some mistranslations in the first version of the questionnaire were identified including the following parts: (press firmly), (that it intersects the horizontal line), and (your willingness). Accordingly, changes were made to the first version, giving rise to the second version. Three adult patients were recruited for the testing. One patient had an issue on understanding the part of the questionnaire that was explaining the methodology of selecting the correct answer, which was changed accordingly to a proposed alternative by the interviewer. Finally, during the proofreading step, two grammatical and four spelling mistakes were identified. Changes were made accordingly, and the final Arabic language version was produced.

Conclusion/recommendations: Arabic is the official language in over than 20 countries and is one of the six official languages of the United Nations. Thus, Arabic version of the FILE will be a useful tool to assess the quality of life in Arabic speaking patients receiving chemotherapy. Additionally, the translated version will be a vital tool for future researches exploring new antiemetic options in cancer patients.

016

Analysis of the effectiveness of a chemotherapy extravasation protocol in a tertiary care hospital

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Objective/purpose: To describe the cases of extravasation that occurred. To assess the degree of compliance of the measures taken with an own protocol for management of chemotherapy extravasations and the effectiveness of the proposals. To identify possible risk factors for extravasation.

Study design/methods: This was a descriptive observational retrospective study set in a 900-bed tertiary care hospital between 2010 and 2015. Chemotherapy extravasation paper records documenting the date and time of event, the extravasated drug, the administration technique, the location, type and size of the lesion, the measures taken, and the evolution of the lesion were filled out by nursing staff. Later, the documents were transferred to the pharmacist,

who, retrospectively, completed the empty fields, and analysed risk factors for extravasation described in the literature, such as risk factors related to the patient (age, peripheral venous disease, and previous radiotherapy), to intravenous infusion (infusion technique and location, previous extravasations, and time to event), and to work shifts (date and time of event). Additionally, the resolution of the extravasation was also documented.

Results/key findings: Seventy extravasations were registered, with an incidence of 0.08%. Twenty-four percent of the extravasated drugs were vesicant, the most frequently implicated being oxaliplatin, paclitaxel and doxorubicin. All the administrations were carried out peripherally. The median age of the patients was 62 years (0.5–82), 17% had peripheral vascular disease and none had received radiotherapy at the administration site. A greater number of notifications was observed during the holiday period and between 01:00 p.m. and 05:00 p.m. The measures taken complied with the protocol in 87.2% of extravasations, and their overall effectiveness was 98.4%.

Conclusion/recommendations: The management of chemotherapy extravasations has been satisfactory. The incidence of extravasation has been low, and the measures taken have been effective, with a high degree of compliance with the extravasation protocol.

Funding: The collection and subsequent processing of the data were integrated into the daily work routine, so no sources of funding were involved in the study.

017
A case study of a patient with pre-existing interstitial lung disease treated with pembrolizumab

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Objective/purpose: Interstitial lung disease (ILD) is noted as a common adverse reaction for immunotherapy; however, there are no prospective data assessing the risk of immunotherapy exacerbating a patient's pre-existing ILD. All clinical trials for patients with lung cancer being treated with immune-checkpoint inhibitors, consistently exclude patients with a history of ILD. Due to the lack of robust safety data, patients may not be offered immunotherapy, as clinicians cannot have confident informed conversations.

This case study looks at a 46-year-old man with non-specific ILD. After his potentially curative left upper lobectomy for a primary lung cancer (pT1aN1 (1/3) M0) moderately differentiated adenocarcinoma in 2015, he completed three out of four cycles of cisplatin and vinorelbine in the adjuvant setting. Two years later, he developed radiological evidence of recurrent disease with pleural thickening and intrathoracic lung secondaries, confirmed by a biopsy (low PDL-1). The best treatment available was a combination of cisplatin, pemetrexed and pembrolizumab. The patient was very keen to have both cytotoxic and immunotherapy treatment, but the risk of worsening his pulmonary fibrosis leading to fatal outcomes was a major concern. After a multidisciplinary review including his ILD specialist, he was consented for the combination treatment with the explicit risk of sudden severe worsening of his ILD.

The objective of this report is to illustrate the outcome of treating a patient with immunotherapy known to have pre-existing ILD in the absence of baseline safety data.

Study design/methods: Case study.

Results/key findings: The patient completed four cycles of pembrolizumab with cisplatin and pemetrexed with minimal toxicity and no adverse impact on his breathing or radiological appearance of his ILD.

A CT scan performed after four cycles demonstrated a good response, with a reduction in the size of the mediastinal and left mammary lymph nodes and reduction in the left pleural thickening of pleural fluid and the size of pulmonary nodules. The good radiological response mirrored his clinical response.

Conclusion/recommendations: Many patients with lung cancer have co-existing lung diseases. The lack of safety data on patients with ILD may preclude them from receiving gold standard treatments, including immunotherapy.

Our report of shared decision making with the patient wanting the best available treatment which was contraindicated in all clinical trials is an example of absence of evidence to confidently offer immunotherapy to a man with stable ILD. Clinical trials have clear eligibility criteria to ensure no confounding factors can influence results. However, most

patients with lung cancer in the real-world have co-existing co-morbidities which may not pose as an added risk.

Clear, open communication with informed consent and patient education on awareness of acute toxicities are key to the safe delivery of systemic anti-cancer treatments. This man continues to have treatment responsive disease and his life extended with no detrimental effect on his ILD.

With the widespread use of immunotherapy in a greater range of cancers, it is imperative that each patient is counselled carefully about the balance of risk and benefits, especially with the absence of evidence.

018

The use of GCSF to reduce the incidence of febrile neutropenia in patients receiving docetaxel for castrate-resistant prostate cancer

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Objective/purpose: Docetaxel plus prednisolone has been a standard treatment for castrate-resistant prostate cancer patients since results published in the TAX327 trial. This trial did not use prophylactic GCSF and 32/332 patients had grade 3 or 4 neutropenia, whilst the actual rate of febrile neutropenia (FN) was low with 3/332.

On the back of a previous audit, the rate of neutropenic sepsis admissions for this patient group at the Christie was 12.3%. A 12.3% chance of FN is considered intermediate risk; however, patient factors in this group (such as age over 65 and advanced disease) increases risk to high. The use of primary prophylaxis with GCSF became standard practice at the Christie for this group of patients.

The effectiveness of this change in practice had to be audited to ensure we were seeing a reduction of FN to enhance patient safety, reduce hospital admissions, maintain dose intensity and to allow completion of treatment. The aim is to determine the rate of FN and outcomes in the castrate-resistant group since switching to primary prophylaxis with GCSF and compare against the previous data to ensure that the use of prophylactic GCSF is warranted.

Study design/methods: Data were collected from the electronic prescribing system to obtain a population size of 35 patients treated with docetaxel for castrate-resistant prostate cancer since the change in practice. This population received a total of 159 cycles of docetaxel, with a median of four cycles (range 1–10). Not all patients had completed treatment.

Incidence of FN was collected from the electronic notes system to give overall rates of FN. Dose reductions and treatment discontinuations were noted as further outcomes.

Results/key findings: The use of primary prophylaxis with GCSF is working in this relatively small sample size of 35 patients with no cases of FN. This in turn meant that there were no dose reductions, treatment delays or discontinuations due to FN. This is a promising sign that prophylaxis is working as expected; however, continued audit will be required with a bigger sample size in a couple of years to ensure this holds true across a bigger population. The comparison with the group patients who had not received GCSF before the change in practice demonstrated a statistically significant decrease in the rate of FN after the chance in practice.

Conclusion/recommendations: Simply changing the electronic prescribing template with the addition of a seven-day course of weight-dependent Filgrastim by default ensured that all patients received GCSF since the practice change. The change in practice was cost effective. The total cost of GCSF for this patient group was £6360 (159 cycles $\times$ £40 per course of GCSF). However, the potential cases of FN prevented is 4 (35 $\times$ 12.3%), with an estimated cost of a suspected FN admission being £1790 for a total potential saving of £7160. A confirmed case of FN would cost even more. In conclusion, not only has the introduction of primary prophylaxis improved patient outcomes it is also cost effective, and at this point should remain standard practice.

019

Psychometric assessment of the Turkish MASCC Antiemesis Tool (MAT) for evaluating chemotherapy-induced nausea and vomiting in female patients with breast cancer

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Objective/purpose: The aim of the study is to assess psychometric properties of the Turkish MASCC Antiemesis Tool (T-MAT) for evaluating chemotherapy-induced nausea and vomiting (CINV) in female patients with breast cancer.

Study design/methods: This methodologic study was conducted in female patients older than 18 years old, accept to participate this study, and came to ambulatory chemotherapy unit to receive high/moderate emetogenic chemotherapy for treatment of breast cancer. CINV was assessed in three cycles of chemotherapy agents including doxorubicin and cyclophosphamide. Turkish version of MAT, where available online at www.mascc.org, was applied after 24 h and five days of chemotherapy. Concurrent validity was assessed by measuring correlation between the Index of Nausea, Vomiting and Retching (INVR) and MAT scores at first day post-chemotherapy. The reliability of Turkish MAT was assessed by internal consistency reliability (Cronbach'a alpha). Factor analysis is also performed.

Results/key findings: A total of 65 female patients with breast cancer completed measured in consecutive three cycles of chemotherapy agents including doxorubicin and cyclophosphamide. The median age of 65 female patients was 49 (41–63). The antiemetic medication combinations received by patients were aprepitant + palonosetron + dexamethasone (52.3%) and aprepitant + ondansetron + dexamethasone (47.7%). There is no significant difference in both total score of Turkish MAT and INVR between contrasted groups according to age (<50 years old ≥50 years old) and total education year (<8 years and ≥8 years) ($p > 0.05$). The Cronbach's alpha was 0.709 for Turkish MASCC Antiemesis Tool (MAT), which presented the reliability of Turkish MAT as acceptable. There is strong correlation between total INVR score measured in the first day after chemotherapy and total MAT score and acute CINV score ($p < 0.05$). There is moderate correlation between total MAT score for first, second and third chemotherapy cycle ($p < 0.001$). According to factor analysis, two factors (nausea and vomiting) were determined.

Conclusion/recommendations: The Turkish MASCC Antiemesis Tool (MAT) had been determined reliable and validated scale to assess patients' acute and delayed nausea and vomiting in female patients with breast cancer.

020

A retrospective study on the clinical impact of gastric acid suppressants on the use of tyrosine kinase inhibitors in non-small cell lung cancer

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Objective/purpose: Tyrosine kinase inhibitors (TKIs) exhibit remarkable efficacy over chemotherapy in non-small cell lung cancer (NSCLC) patients with mutations in epidermal growth factor receptor (EGFR). However, concurrent therapy of gastric acid suppressants (AS) may reduce absorption of TKIs and hence affect the clinical outcome. However, the extent of the effect on the clinical outcome remains unknown. The study aims to investigate the clinical impact in terms of safety and efficacy.

Study design/methods: This study is a retrospective study. Adult patients taking erlotinib or gefitinib for NSCLC with EGFR-positive mutations in United Christian Hospital were recruited. They were identified from the Clinical Data Analysis and Reporting System if they were dispensed erlotinib or gefitinib during January 2012–December 2016. Patients concurrently taking TKI and proton pump inhibitors (PPI) or histamine-2 receptor antagonists (H2RA) were included as PPI and H2RA groups, respectively. Patients who did not take PPI or H2RA were classified as non-gastric AS users. The primary outcome was the progression-free survival (PFS). The secondary outcomes were the overall survival (OS) and the incidence of adverse effects among the three groups.

Results/key findings: Among 249 patients, 59 and 63 patients were taking PPI and H2RA, respectively, while 127 patients were non-AS users. Median PFS was 11.7, 12.9 and 14.5 months, respectively, in non-AS, PPI and H2RA groups, which were not

significantly different from each other ($p = 0.231$). There was no significant difference in OS (17.1 vs. 16.2 vs. 20.4 months for non-AS, PPI and H2RA, respectively, $p = 0.062$). Adverse effects were not different from each group except more grade 2 skin rash in non-AS group (21.3% vs. 8.6% in PPI vs. 20.6% in H2RA, $p = 0.042$).

Conclusion/recommendations: Concomitant use of PPI and H2RA did not affect the clinical efficacy or toxicity of erlotinib or gefitinib in patients with NSCLC and EGFR mutations.

021

An audit of safety profile of cyclin-dependent kinase (CDK) 4/6 inhibitors in advanced breast cancer patients

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Objective/purpose: CDK4/6 inhibitors are designed to induce cell death by preventing CDK4/6-mediated phosphorylation of retinoblastoma protein, hence halting tumour growth. Three CDK4/6 inhibitors-palbociclib, ribociclib, and abemaciclib have attained marketing authorisations successively in the UK for the treatment of HR+/HER2− advanced breast cancer, in combination with endocrine therapy. The aim of this audit is to evaluate the toxicity and tolerability of CDK4/6 inhibition in real-world compared to those reported in phase III trials.

Study design/methods: Electronic records were scrutinised for patients starting CDK4/6 inhibitors between July 2017 and March 2019 at the Queen Elizabeth Hospital Birmingham (QEHB). Data were collected and analysed using Microsoft Excel. Abemaciclib is not discussed in this study due to insufficient data.

Results/key findings: Fifty-seven patients starting CDK4/6 inhibition therapy at the QEHB were included in this study. The median age was 58 years. Seven patients (12.3%) had locally advanced disease and 50 (87.7%) had metastatic breast cancer. 35.1% patients had bone-only metastasis.

The most common grade 3/4 AE of myelosuppression was neutropenia, with a higher incidence of 66.7% treated with ribociclib, compared to 52.1% with palbociclib. Gastrointestinal AEs were commonly of lower grades in nature, such as nausea, vomiting, constipation, and diarrhoea. Notably, high incidence of elevated alanine aminotransferase (ALT) was observed in both groups (35.4% in palbociclib and 44.4% in ribociclib). The other common adverse events were arthralgia, myalgia, fatigue, infection, and mucositis.

In palbociclib group, eight patients (16.7%) discontinued treatment for disease progression (PD) and three (6.3%) for drug toxicity. 56.3% patients had treatment deferrals and 85.2% deferrals were due to toxicity. 43.8% patients had dose reduction once and 14.6% had a second dose reduction. Neutropenia constitutes the main reason for both treatment deferrals (65.6%) and dose reductions (80.4%).

In ribociclib group, two patients (22.2%) discontinued treatment due to PD, while the majority (66.7%) stayed in treatment. 55.6% patients had treatment interruption, 80% of which were due to toxicity. 44.4% and 11.1% patients had dose reduction once and twice respectively. Non-toxicity reasons accounted for majority of the deferrals (42.9%), while neutropenia (35%), transaminitis (25%) and fatigue (20%) were responsible for most dose reductions.

Conclusion/recommendations: Haematologic adverse events were most commonly observed with CDK4/6 inhibitors in the clinic. The incidence of neutropenia was similar to the data reported in phase III trials. However, the rates of leucopenia, anaemia and thrombocytopenia were much higher. Among those non-neutropenia myelosuppression cases, the incidence of severe events (grade 3/4) was similar to PALOMA-2 trial with palbociclib, while ribociclib data were higher compared to its MONALEESA-2 trial which might be due to the limited number of patients. These myelotoxic effects were successfully resolved with appropriate care and dose reductions. Asymptomatic elevations of ALT were also observed which were uncomplicated and manageable. Six in nine patients had electrocardiogram monitored during ribociclib treatment, and no QT interval prolongation was observed. The CDK4/6 inhibitors were generally well tolerated. Nevertheless, early and close monitoring of the side effects and appropriate management are crucial. Further investigations are required to study the safety profile of abemaciclib.

022

Bring care closer to home? Service users' perceptions of receiving injection treatment in hospital, community and at home

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Objective/purpose: 'Bringing care closer to home' is a major step forward in improving patients' access to healthcare. With rising demands within the NHS, improving access to healthcare can help improve a patients' quality of life, reduce stress and potentially save the patient time and money. The Lloyds' Infusion and Injection Clinic was the first community injection service established in November 2018. In this early phase of service implementation, it is important to understand patients' experiences and perceptions of service users to establish further evaluation framework and inform service expansion.

The qualitative study aimed to understand injection service users' experiences and value of services, and to explore their views and perceptions of receiving injection treatments provided in hospital, community or at home.

Study design/methods: Two focus groups were conducted on patients who received injections from the Lloyds' Infusion and Injection Clinic and patients who received injections from hospitals, respectively. The focus groups were facilitated by an academic researcher and one research student and guided by a semi-structured schedule which explored patients' previous experiences of receiving treatment and their views about receiving injection treatments in hospital, community and at home. Participants were ensured anonymity and confidentiality and consent to participant and audio-recording. Focus groups were audio-recorded and transcript verbatim for the thematic analysis. This research was approved by the Division of Pharmacy and Optometry's ethics committee at the University of Manchester.

Results/key findings: Seven community service users (one male) and four hospital service users (one male) participated in the focus groups. All participants were diagnosed with cancer. The saturated theme identified from both groups was the value of services, including patient-centred, trustworthy, personalised and flexible care. However, each community service user transferred from hospital care to community care via different routes with a minority of patients given the choice.

I was a bit upset actually because I felt like I had to come here (Lloyd's healthcare centre). It's lovely now, I'm quite happy about coming here and I get an excellent service but at the time I did feel a little bit upset about it.

One of the key areas highlighted consistently by community and hospital service users was the importance of convenience and accessibility.

When I make my appointment now, I can make it before I go to work, in my dinner hour when I leave. I can just get on with my life.

If I had to start treatment again, I think I'd be booking Travelodge the night before to stop that stressful journey (to hospital).

Finally, participants could see the benefits of homecare; however, the extent of personalised care and responsibility can breach what is considered acceptable to users.

Conclusion/recommendations: Although the preference and satisfaction with injection treatments are highly associated with patients' experiences, participants demonstrated consistent views on the value of services. In line with a previous patient survey, patients satisfied with the high-quality, personalised, flexible and convenient community injection service. To expand the service, it is needed to identify the optimal outcome measures for future evaluations.

Funding: Out of Hospital Injection and Infusion Services, McKesson UK.

023

Incidence of temozolomide-induced myelosuppression during concomitant radiotherapy and subsequent impact on adjuvant chemotherapy in anaplastic astrocytoma patients

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Objective/purpose: Anaplastic astrocytomas (AAs) are grade III gliomas currently treated with

debulking surgery and adjuvant radiotherapy. The interim analysis from the CATNON trial has shown that adjuvant temozolomide (TMZ) starting four weeks after the completion of radiotherapy had an overall survival (OS) benefit within this population (five-year survival 55.9% vs. 44.1%). This treatment strategy has been included within National Institute for Health and Care Excellence guideline 99 and is now offered within the NHS. The role of TMZ during radiotherapy is yet to be confirmed. In practice, clinicians often utilise concurrent TMZ with hope of additional benefit; the BR14 study aims to evaluate this practice. Concerns have been raised that patients may be experiencing myelosuppression during the chemoradiotherapy phase and are missing adjuvant TMZ, which is where we believe the most benefit is conferred.

Objectives:

- Identify the number of AA patients receiving concurrent and adjuvant TMZ
- Identify the number of patients experiencing myelosuppression during concomitant TMZ and how this is managed
- Explore the impact myelosuppression during chemoradiotherapy has on adjuvant TMZ

Study design/methods: A single-centre retrospective observational study was conducted at the University Hospitals Birmingham NHS Foundation Trust. Prescribing, histology and biochemistry data, scan results and clinical letters were manually extracted from the PICS® and Clinical-Portal® systems. Data were extracted from January2015 to February 2019.

Results/key findings: Complete data were available for 25 patients; seven were excluded as they did not receive treatment.

All patients included received radiotherapy. 94.4% (17/18) had concurrent TMZ – 1 patient was randomised to radiotherapy alone as part of the BR14 study. 100% (18/18) of patients completed their radiotherapy course.

Of the 17 chemoradiotherapy patients, all were prescribed 75 mg/m^2 TMZ daily for the duration of radiotherapy, 5/17 (29.4%) stopped TMZ early during the concurrent phase due to myelosuppression; the mean number of days of TMZ treatment was 32.6 of the planned 45 days. 80% (4/5) did not go on to have adjuvant TMZ due to concerns around myelosuppression. The patient who did receive adjuvant TMZ was delayed and dose reduced.

Of the 12 patients who completed their concurrent phase without significant myelosuppression, 11 were planned for adjuvant TMZ (one patient on BR14 study not randomised to adjuvant TMZ). 100% (11/11) started their adjuvant phase on time.

Of the adjuvant patients, 25% (3/12) are receiving ongoing treatment. Of the nine who completed adjuvant TMZ, 66.7% (6/9) completed the planned number of cycles, 22.2% (2/9) had progressive disease and stopped treatment early and one patient stopped due to a hypersensitivity reaction. The average number of cycles completed was 8.4 (range 4–12). 66.6% (6/9) of patients were able to receive 100% dose intensity of their planned adjuvant TMZ, 33.3% (3/9) were dose reduced at some point during treatment; 33.3% (1/3) due to myelosuppression.

Conclusion/recommendations: Around 28% of patients did not receive adjuvant TMZ due to myelosuppression during their chemoradiotherapy phase. As data are immature, we are unable to see whether this translates to a difference in OS. A larger, appropriately powered study will be useful in further evaluating these differences.

024
Hypersensitivity reactions to chemotherapy drugs in a public hospital in Mexico

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Objective/purpose: Hypersensitivity reaction (HRSr) will be cause for all chemotherapy drugs, but some groups have been associated with more risks, like taxanes, platins, and monoclonal antibodies. The clinical manifestation includes symptoms dermatologic, gastrointestinal, and respiratory and the severe reaction, anaphylaxis, edema, angioedema and sometimes the death. The aim to this study was determined incidence and characteristics of hypersensitivity reactions that developed during treatments with chemotherapeutic drugs.

Study design/methods: We reviewed HRSr that occurred in the chemotherapy's application area in one public hospital in Mexico, in the period January–December 2017. We have recollected the

dates from the patient, medication, reaction, premedication and the medical treatment to manage HRSr. We classified the HRSr in accordance to the common toxicity criteria version 5.0.

Results/key findings: fifty-four out of 182 reactions to the infusion of chemotherapeutic drugs presented hypersensitivity reactions (29.6%). The group of patients that presented more HRSr was women (96%) between the ages of 41 and 60 years old (57%), who were diagnosed with breast cancer (57.4%). Six groups of chemotherapeutic drugs were associated to HRSr (1) taxanes (docetaxel (n = 20), paclitaxel (n = 16)); (2) platin (carboplatin (n = 4), oxaliplatin (n = 4), cisplatin (n = 1)); (3) asparaginase (n = 5), (4) alkylating agents (cyclophosphamide (n = 2)); (5) monoclonal antibodies – MocAb (rituximab (n = 1)); (6) anthracycline (liposomal doxorubicin (n = 1)). Severity grade 3 was presented in 66.6% in patients infused with taxanes (n = 26), platins (n = 5), asparaginase (n = 3), and alkylating agents (n = 1). Grade 1 to 2 were associated to 27.7% of HRSr in patients with treatment of MocAb (n = 1, and alkylating agents n = 1); for the grade 4, it was present in less number of patients (3), with docetaxel and oxaliplatin infusion (2 and 1). In nurse records, the time to start the premedication is unknown. Premedication is done according to the drugs, patient's condition and physician prescription; thus, the institution lacks guidelines of prevention and management of reactions to chemotherapeutic agents.

Conclusion/recommendations: Incidence of HRSr due to chemotherapeutic drugs was elevated, mainly in taxanes. The HRSr was severe or medically significant but not immediately life-threatening; hospitalization or prolongation of hospitalization indicated. For this, it is necessary to review nurses tool, develop guidelines for pre-medication infusion and management of HRSrs to chemotherapeutic agents.

025
An audit of Akynzeo® for the prevention of nausea and vomiting after chemotherapy

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Objective/purpose: Akynzeo® (netupitant/palonosetron) is used for the prevention of nausea and vomiting in patients receiving moderately emetogenic chemotherapy and highly emetogenic cisplatin-based chemotherapy. At our institution, Akynzeo® replaced our previous standard of care (aprepitant plus ondansetron) in 2017. Prior to the switch, an audit of the effectiveness of aprepitant plus ondansetron was undertaken. That combination was found to be effective at preventing emesis in 82% of treatment cycles. No nausea was reported for 55% of cycles and no significant nausea for 93% of cycles. The aim of this follow-up audit was to evaluate the effectiveness of Akynzeo® against the same audit standards (listed below), based (where available) on relevant clinical trial literature.

1. 40% of treatment cycles will result in a CTC nausea score of 0 (i.e. no nausea)
2. 70% of treatment cycles will result in a CTC nausea score of 0–1 (i.e. no significant nausea)
3. 75% of treatment cycles will result in a CTC vomiting score of 0
4. 90% of patients will not need to contact the Trust chemotherapy helpline because of issues relating to nausea and/or vomiting
5. 95% of patients will avoid readmission to hospital because of uncontrolled nausea and vomiting
6. 95% of patients will avoid chemotherapy dose delays/reductions related to nausea and vomiting

Study design/methods: During a six-month period in 2017, all oncology patients starting treatment with a chemotherapy regimen containing Akynzeo® were eligible for inclusion in the audit. Data relevant to the audit standards were collected from the Trust electronic prescribing and clinical noting systems for all cycles of chemotherapy received by eligible patients, and were then analysed using Microsoft Excel®.

Results/key findings: Data were collected for 100 consecutive patients (57 female, 43 male) receiving an Akynzeo®-based anti-emetic schedule. The most common chemotherapy regimen was FEC (34 patients). Patients received a median of three cycles of chemotherapy (range 1–6) with a total number of cycles of 317. If missing data are excluded, Akynzeo® was effective at preventing emesis in 95% of treatment cycles. Similarly, no nausea was reported for 67% of cycles and no significant nausea for 97% of cycles.

The Trust 24-h chemotherapy helpline received 14 calls from 14 patients (14% of the audit population) who were suffering from nausea and/or vomiting at home. The majority of calls (79%) occurred after cycles 1 or 2. Six patients (6%) were admitted to hospital for reasons partially or wholly related to

nausea and vomiting. One patient (1%) required a chemotherapy dose reduction because of nausea and vomiting, but there were no treatment delays due to this complication.

Conclusion/recommendations: Overall, Akynzeo® met four of the six predefined audit standards. The retrospective nature of the audit was a shortcoming, as missing data impacted on the ability to draw firm conclusions on the efficacy of Akynzeo® against some of these standards. Although the audit populations are not directly comparable, based on the results of the previous audit of aprepitant plus ondansetron, the rates of nausea and vomiting appeared to be lower in the more recent cohort who received Akynzeo®.

Funding: Chugai Pharma UK Ltd.

026

Pharmacy students' perceptions and knowledge on palliative care in oncology

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Objective/purpose: Along with an increased provision of palliative care services in health systems, it becomes more important for health professionals to be specialized in this area and take active role in a multidisciplinary care team. However, practices of health professionals in the provision of palliative care can be different due to acquired knowledge and perceptions during undergraduate education in the profession.

The aim of this study was to identify the pharmacy students' knowledge and perceptions in the field of palliative care in oncology.

Study design/methods: This exploratory study was undertaken among the fourth and fifth grade pharmacy students at the Hacettepe University in February 2019. A structured survey questions specific to the research were prepared by the researchers through comprehensive literature review; the final version of the questionnaire consisted of 14 questions (three questions for demographics, five multiple choice questions for knowledge and six questions for perceptions on Likert scale), and the survey link (Google Forms) was shared with students via mailing groups.

Results/key findings: A total of 144 students (74.1% female; 74 and 70 students were on the fourth and fifth grade, respectively) responded to the survey. The median (minimum−maximum) age of the participants was 23 (21–27) years.

The majority of the students (75.7%, n = 109) indicated that they are aware of the concept of palliative care; however, 11.8% stated not aware at all. The participants acknowledged that the palliative care can be provided at the palliative care center (91.7%, n = 132), at wards in hospitals (80.6%, n = 116) and in the nursing homes (73.6%, n = 106), but only 25.7% (n = 37) of participants stated that it can be provided at hospital emergency services. Students reported the following as being members of the palliative care team: doctors (93.8%, n = 135), clinical pharmacists (87.5%, n = 126), hospital pharmacist (75.7%, n = 109) and nurses (70.1%, n = 101). However, over one third of the participants did not differentiate the roles between a pharmacist who works in palliative care and in oncology settings (n = 52) or clinical pharmacist (n = 44).

The majority of the students (69.4%, n = 100) believed that palliative care should not be provided to cancer patients only, but can also be provided to the patients with chronic diseases such as diabetes, Alzheimer, tuberculosis (54.1%, n = 78), concurrently with curative treatment (69.4%, n = 100) or as the last choice at the final stage of the disease (29.4%, n = 42).

Fifty-seven per cent of students (n = 82) stated that palliative care requires a specialization in health professions. Although a majority of participants (87.5%, n = 126) indicated to have a seminar/course on palliative care during undergraduate education, only 34% (n = 49) would like to specialize in the field of palliative care in the future.

Conclusion/recommendations: The palliative care services are commonly implemented in various diseases at different healthcare settings, particularly in patients with cancer. An increased awareness among healthcare providers on the importance of provision of palliative care should be initiated at the undergraduate education and maintained throughout the professional career. Therefore, the palliative care should be a part of the curriculum

not only in pharmacy, but also in other health professionals' education.

027
Collaborative audit of implementation of palbociclib access programme across five cancer centres

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Objective/purpose: In April 2017, an access scheme was initiated for palbociclib within its licensed indication. In clinical trials, there was a 66% incidence of grade 3 neutropenia, and therefore a combined audit has been undertaken to assess safety and efficacy. Initial results were presented at BOPA 2018, abstract 4. The primary aim of the audit was to review safety data during the first three cycles, with secondary aim to evaluate effectiveness.

Study design/methods: Ongoing review of case notes of all patients enrolled in the programme, with data analysis at 31 March 2019.

Results/key findings: Across the five Trusts, 142 patients were enrolled in the palbociclib access programme, with 130 starting treatment. All 130 had ER positive, HER2 negative advanced breast cancer, 125 with metastatic disease. Twenty-five patients presented with de novo advanced disease and 61 had bone-only metastases.

As part of the protocol for treatment, full blood count is repeated at day 14 of cycle 1 and cycle 2. At cycle 1 interim check, 21 of 115 patients with results available had grade 3 neutropenia. One hundred and twenty-two patients commenced cycle 2, with 42 patients deferred on day 1, 27 due to grade 3 neutropenia and 5 due to grade 4 neutropenia. Eight patients discontinued prior to cycle 2; three due to concurrent illness, one for fatigue, two due to disease progression and two died. Twenty-six patients were dose reduced at cycle 2, 20 for neutropenia and 6 for other toxicities.

At cycle 2 interim check, 92 patients had results available with 11 patients having grade 3 neutropenia.

One hundred and twenty patients commenced cycle 3. Twenty-five patients were deferred at day 1 and 12 had been dose reduced at cycle 2. Dose reductions were predominantly for recurrent or prolonged neutropenia. Three patients were admitted for neutropenic sepsis during the first three cycles, occurring after interim blood test and have subsequently resumed treatment with a dose reduction.

On 31 March 2019, 65 patients continue on treatment (33 on 125 mg, 21 on 100 mg and 11 on 75 mg). Sixty-five patients have discontinued palbociclib, 47 due to disease progression, 1 complete response, 1 patient choice, 9 due to adverse events, 2 died and 5 had concurrent illnesses.

Median progression-free survival is calculated at 22 months (with 95% confidence interval 15.3 to 28.6 months) based on 127 patients with known date of disease progression.

Conclusion/recommendations: Neutropenia is the most frequent side effect leading to dose reduction. Thirty-two from 122 patients had grade 3/4 neutropenia at the start of cycle 2. Twenty patients had a dose reduction to 100 mg at this point. Therefore, at initiation of treatment, neutropenia is a key side effect to discuss with patients to ensure that they understand the need for monitoring and how to contact 24-h support if unwell.

With short follow-up duration, median progression-free survival is 22 months. In a non-trial population, this compares favourably to the registration trial PALOMA2; the progression-free survival after three years' follow-up was 27.6 months.

028
Clinical audit on the use of fulvestrant in advanced breast cancer patients

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Objective/purpose: The aim of the audit was to evaluate the duration of treatment with fulvestrant amongst a real-world population of patients in a single institution with advanced breast cancer.

Secondary endpoints were progression-free survival (PFS) and overall survival.

Study design/methods: Retrospective audit of all NHS patients treated at the Clatterbridge Cancer Centre between 2012 and 2017 (excluding patients receiving treatment as part of a clinical trial) with locally advanced or metastatic oestrogen receptor (ER) positive breast cancer. Case note review was undertaken; data collected included staging, histology, adjuvant hormone-directed treatment given, number of lines of hormone-directed treatment, length of time from starting fulvestrant until received chemotherapy, number of lines of chemotherapy after fulvestrant and overall survival.

Results/key findings: A total of 386 patients were identified from electronic systems, with 18 patients excluded due to insufficient information or missing case notes. Of the 368 patients included, 328 had metastatic disease and 40 had locally advanced breast cancer. Eighty-three patients presented with de novo metastatic disease. Forty patients were confirmed HER2 positive. Mean age 67 years, with range of 32 to 94 years.

Data cut-off on 31 March 2019, 17 patients were ongoing with fulvestrant and 67 were still alive.

Fulvestrant was administered as first-line endocrine treatment in 62 patients, second line in 109 patients and third line in 90 patients.

For all 368 patients, up to and including 31 March 2019, median duration of treatment is 151 days.

Of the 351 patients who have completed treatment, median duration of treatment is 139 days (range 1 to 1903). For the 17 patients with treatment ongoing, median duration is 1191 days (range 602 to 2233 days).

One hundred and twenty-seven patients received chemotherapy for advanced breast cancer prior to fulvestrant (for the purpose of this audit, this includes everolimus given in combination with exemestane). Ninety-four patients had fulvestrant as an early line of treatment followed by chemotherapy, with median duration of seven months from the commencement of fulvestrant to chemotherapy. One hundred and seven patients did not receive chemotherapy for their advanced breast cancer.

Two hundred and one patients received fulvestrant prior to chemotherapy or did not receive chemotherapy for advanced breast cancer (with the exclusion of patients still receiving active treatment).

Median treatment duration was 5.06 months for first-line treatment, and 4.95 months in the overall population. Median PFS in first-line treatment was 14 months. Median overall survival for all patients was 18 months.

Conclusion/recommendations: 34.5% of patients received fulvestrant prior to chemotherapy and therefore did not benefit from a delay in starting chemotherapy for advanced disease from this additional endocrine option.

For those patients where fulvestrant was administered prior to chemotherapy, a benefit of seven months was observed from the start of fulvestrant to commencing chemotherapy.

Median duration of treatment for all patients is lower than observed in clinical trials at 151 days.

The PFS and OS results compare favourably with clinical trial results from FALCON and CONFIRM. There was significant variation in sequencing of endocrine treatment in our patient group.

029

Sharing the care – Hospital and community pharmacy partnership for the management of glucocorticoid-induced diabetes (GID)

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Objective/purpose: Glucocorticoids are commonly prescribed for anticancer treatment and supportive care of patients with cancer receiving chemotherapy and/or radiotherapy. Patients can experience acute hyperglycaemia associated with GID, leading to adverse health outcomes and in some cases requiring emergency/intensive care. This study aimed to assess the feasibility of a new community-pharmacy program to monitor and manage GID among patients

with cancer discharged from hospital on high-dose glucocorticoids.

Study design/methods: Program and clinical pathway development included multidisciplinary consultation, consumer and industry engagement at an Australian public specialist cancer hospital. Eligible inpatients received high-dose glucocorticoids with treatment duration of >7 consecutive days or as part of pulsatile corticosteroid therapy. Patients were excluded if glucocorticoids of duration <7 days (low risk) or with pre-existing diabetes and raised haemoglobin A1c (HbA1c) >6.5% (high risk for medical monitoring/intervention).

The program was implemented in a pilot phase and assessed for operational feasibility over 18 months (October 2017–April 2019). Feasibility outcomes included the proportion of patients on high-dose glucocorticoids eligible/ineligible for program enrolment (clinical need), and among eligible patients' assessment of referral uptake and retention rates (service delivery). Healthcare outcomes were collected from community pharmacies including twice weekly blood glucose level (BGL), three-monthly HbA1c and implementation of medical referral pathways. Consumer-reported outcomes/satisfaction was assessed for a subset of patients by follow-up phone call one month after program enrolment.

Results/key findings: The program, including protocol for community-pharmacy monitoring with algorithms for referral/action pathways, was approved by the Hospital Therapeutics Advisory Committee. Of the patients screened (n = 216), 153 (71%) met pre-defined eligibility criteria. Of these, 114 (75%) consented to enrolment and 51 (45%) subsequently attended community pharmacies. Reasons for non-attendance included early cessation of glucocorticoids (n = 4), alternate BGL monitoring methods (n = 17), hospitalisation/palliation (n = 13), death (n = 15) and travel distance concerns/lost to follow-up (n = 14).

Of 51 patients who attended community pharmacies, 6 met criteria for escalation of care with 5 referred to GPs (BGL > 12 mmol/L) and 1 to hospital (BGL > 15 mmol/L).

A sub-set of patients attending community pharmacies (n = 16) consented to telephone follow-up. The majority reported overall positive experience with a full understanding of the program (13/16) and found the program to be beneficial (12/16). Comments included "well organised", "quick and efficient", "pharmacist took action". Consumer-identified limitations of the program included distance/time constraints (n = 2), request for additional written information (n = 1) and an alternative method of BGL monitoring (n = 1).

Program modifications based on pilot data included revision of eligibility criteria to increase clinical cases, alternative methods of monitoring in addition to community-pharmacy, development of written information and mechanisms for real-time reporting of outcome data. Expansion of the eligibility criteria increased clinical cases by 38% over a six-month period pre and post expansion. Other modifications are currently being prepared for implementation.

Conclusion/recommendations: This pilot study demonstrated feasibility and utility of community-pharmacy-based monitoring and management of GID within a framework for medical intervention and escalation. Review and refinement post implementation were important to meet clinical and consumer needs. Future efforts will focus on consumer driven and alternate models of care to meet mixed needs.

Funding: Sigma Healthcare provided funding to support community-pharmacy services.

030
Disinfectant efficacy of ultraviolet irradiation and validation of the cleaning procedure in a robotic system for aseptic preparation of antineoplastic drugs

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Objective/purpose: The fully automated aseptic preparation with APOTECAchemo ensures the sterility of the ready-to-use antineoplastic drugs by means of well-controlled aseptic procedure. This includes also ultraviolet (UV) irradiation and manual disinfection of the internal surfaces to remove any potential viable microorganism. Nevertheless, the efficacy of the UV disinfection depends on a number of factors, such as exposure time and presence of shadow zones. The aim of this study was to define the minimum UV irradiation for achieving at least a 99% reduction of the microbiological bioburden and to measure the UV intensity in different areas of the robot.

In addition, microbiological environmental controls were performed to validate the cleaning efficacy of the UV irradiation combined with the manual disinfection procedure.

Study design/methods: The study was carried out in robotic system APOTECAchemo installed in a Grade C cleanroom of the centralized preparation unit of the Capital Region Pharmacy (Herlev, Denmark). The minimum UV irradiation in W/m^2 was defined based on the exposure time recommended by the manufacturer (4 h) and the UV dose applied to achieve a 4-log reduction (99.99%) of *Bacillus anthracis* spore according to the literature ($620\,J/m^2$). The intensity of UV irradiation was measured with a radiometer on 46 locations inside the robot. Additional microbiological controls with contact plates were performed at different time points. In Test 1, samples were taken 4 h after starting the production, after cleaning by wiping with water and ethanol, and after 4-h UV irradiation on 33 locations of the robot over three consecutive days. In Test 2, 13 locations were sampled after a period of 28 h and 76 h after start of UV irradiation, during which the normal stand-by status (robot closed and laminar airflow powered off) was simulated.

Results/key findings: The minimum UV irradiation was set at $>0.05\,W/m^2$. The measurements of UV irradiation intensity fulfilled the requirements in all 46 locations including the shadow zones. Overall, the UV intensity level ranged from $0.55\,W/m^2$ in the carousel to $10.24\,W/m^2$ in the loading area of the robotic system. In Test 1, microbial surface monitoring matched the recommended limits set for cleanroom Grade A zones (<1 CFU) after 4-h production, after cleaning, and after 4-h UV irradiation. The number of CFU detected 28 h and 76 h after the robot shutdown (Test 2) were below the limits, thereby indicating no contamination with microorganisms.

Conclusion/recommendations: The results revealed that UV irradiation is powerful enough to achieve the required microbiological bioburden reduction. Also in the shadow zones of the robot, the minimum UV irradiation is guaranteed thanks to phenomena of reflection. The results of the microbiological controls confirmed that the cleaning procedure and the UV irradiation of the surfaces inside the robot are effective and ensure the maintenance of sterility conditions over time. In particular, it showed that no further cleaning is required after a normal shutdown (e.g. after a weekend).

031

A pharmacist's involvement in identifying anticoagulants-related problems in patients with cancer

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Objective/purpose: The National Comprehensive Cancer Network (NCCN) guideline recommends the use of anticoagulants in hospitalized cancer patients for a prophylaxis in venous thromboembolic events (VTE) due to the fact that patients are at higher risk of developing VTE. In combination with other supportive therapies, the prevalence of drug related problems can be increased in cancer patients. Therefore, this study aimed to identify drug-related problems (DRPs) with anticoagulant treatment in patients with cancer by an involvement of a clinical pharmacist.

Study design/methods: The study was conducted in a University Research & Training Hospital during September–December 2018 in Turkey. The patients who are aged over 18 years and hospitalized during study period were included. A clinical pharmacist reviewed anticoagulants and antithrombotic medications according to the NCCN Cancer-Associated Venous Thromboembolic Disease Guideline v.1.2018, identify and solve any if occurred. The DRPs (P1.treatment effectiveness, P2.safety and P3.others) and causes (C1.drug selection, C2.drug form, C3.dose selection, C4.treatment duration, C5.dispensing, C6.drug use/process, C7.patient related and C8.others) were classified according to the Pharmaceutical Care Network Europe (PCNE) Classification V8.02. The planned interventions (clinical pharmacist's recommendations) were proposed directly to the prescriber, and the acceptance rate was recorded. The ethics approval was obtained from the University Non-Clinical Trials Ethics Committee.

Results/key findings: A total of 100 patients (47% female, median age: 58 (min: 20, max: 86) years) were included. Commonly seen cancers were lung (n = 14), breast (n = 12), stomach (n = 8), pancreas (n = 8) and colon (n = 7), and 13 patients had a previous VTE attack before hospitalization (2 were within the last 6–12 months). A clinical pharmacist identified 73 DRPs and related causes in 60 patients (1.2 problem/patient). All DRPs, but

one (P3.other: unnecessary drug treatment), were related with treatment effectiveness (P1; n = 72); of those, 26 (36%) were 'effect of drug treatment not optimal' and 46 (64%) were 'untreated symptoms or indication'. The causes of DRPs were due to drug selection (C1, n = 47), dose selection (C3, n = 15) and others (C8, n = 11). Among the causes of drug selection, there was no drug treatment in spite of existing indication (n = 46) and no indication for drug (n = 1), where a clinical pharmacist recommended to initiate prophylactic anticoagulant (the acceptance rate of 21.7%) and to stop aspirin in a patient with no indication (100%, accepted), respectively. The dose of anticoagulants was too low (n = 6) or too high (n = 9), but it was corrected after the recommendations (16.7% and 100% of acceptance, respectively). As for other causes (C8), dalteparin was suggested to be used instead of low-molecular weight heparin (n = 11); however, this recommendation was not accepted due to unavailability of dalteparin at the hospital.

Conclusion/recommendations: A great majority of DRPs with anticoagulants were related with drug and dose selection which effects the success of VTE prophylaxis in patients with cancer. The clinical pharmacists are in a unique position to identify DRPs and optimize drug treatment in order to maintain effective therapy in patient with cancer.

032
Attitudes of medical oncologists on the treatment of cancer-associated venous thromboembolism

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Objective/purpose: It is known that the National Comprehensive Cancer Network (NCCN) guideline recommends the use of anticoagulants in hospitalized cancer patients for a prophylaxis in venous thromboembolic events (VTE), but prophylactic use of anticoagulant in outpatients depends on physicians' assessment of patient. This study aimed to explore the attitudes of medical oncologists on the use of anticoagulants in oncology outpatients.

Study design/methods: The online survey (Google doc) was collaboratively designed by a clinical pharmacist and a medical oncologist and consisted of 22 questions regarding the medical oncologists' opinions on VTE prophylaxis in cancer patients and their expectations from a clinical pharmacist. The survey link was shared within medical oncologists mailing group (n = 100) in Turkey via e-mails during September–December 2018 along with two reminders. The ethics approval was obtained from the University Non-Clinical Trials Ethics Committee.

Results/key findings: A total of 62 (76% male, 50% aged 36–45 years) out of 100 medical oncologists participated in the survey who were mainly practicing in oncology for 3–10 (n = 33) and >10 years (n = 18); working at university hospitals (n = 46) or training and research hospitals (n = 32) and treating >200 patients/month (n = 36).

In regards to the most important risk factors indicated by oncologists in prescribing anticoagulants at inpatient or outpatient setting for VTE prophylaxis were history of VTE (n = 55), immobilization (n = 52) and tumor/cancer type (n = 42). A majority of oncologists (n = 60) were preferred to use low-molecular weight heparins (LMWHs) in general. The use anticoagulants for inpatients was 'usually (n = 25)' or 'sometimes (n = 22)' considered at the admission; 64.5% (n = 40) of oncologists preferred to use during the hospitalization and 19.4% (n = 12) until one month after the discharge, if no contraindication exists, whereas 48 indicated to use 'sometimes' in outpatient settings, mainly for patients with pancreas (n = 61) and stomach (n = 34) cancer. There was statistically no difference in the preferences of oncologists between anticoagulant use in inpatients and outpatients ($p < 0.05$). Unfortunately, 24 oncologists indicated not heard of the Khorana Risk Score for the risk assessment of VTE in patients with cancer; however, 22 indicated to use at their practice.

The participants (n = 51) did not seek any information about anticoagulants from a clinical pharmacist; however, they would like to have supports on information for drug interactions (n = 45), patient education (n = 40), stability and incompatibility (n = 33), education for health professionals (n = 27), dose adjustment (n = 22), contraindications (n = 16), guideline-adherent prescribing (n = 15) and VTE risk assessment (n = 14).

Conclusion/recommendations: Medical oncologists acknowledged the need for prophylactic use of anticoagulants in patients with cancer; however, their

attitudes on using at outpatient settings were variable. The routine risk assessment for VTE can be considered in order to evaluate the patients' needs, and clinical pharmacist can be integrated at outpatient settings for the risk assessment and optimization of anticoagulant therapy in patients with cancer.

033

Exploring the role of the pharmacy technician in an ambulatory oncology unit

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Objective/purpose: Lord Carter recommended that pharmacists and pharmacy technicians spend more time on patient-facing medicine optimisation activities. The expanding role and scope of pharmacy technicians in the outpatient cancer setting has been described in the literature. In February 2019, a Band 6 pharmacy Medicines Management Technician (MMT) was appointed to join a team of oncology pharmacists at the London North West University Healthcare NHS Trust. The aim of the project sought to explore the contributions of the MMT in a well-established clinical oncology pharmacy service to the outpatient chemotherapy suite.

Study design/methods: Prospective data were collected on all activities performed by the MMT during March and April 2019. Data were collected to measure how the MMT's role affected general productivity, efficiency and cost implications of the chemotherapy suite. We collected data on the number medication histories completed, type on interventions made and value of medication returned to stock. Data were recorded on an Excel spreadsheet. Descriptive statistics were used for analysis. Ethics approval was not required.

Results/key findings: During March and April 2019, the MMT completed 75 medication histories; mean-=9 per week. The MMT completed accurate medication histories including prescribed and non-prescribed medication for all patients before the start of systemic anti-cancer therapy (SACT) treatment. Interventions made by the MMT during March and April included counselling patients and carers on medication, identifying medication duplication (e.g. aspirin and over-the-counter Anadin® Extra), identification of adherence issues, identification and continuation of critical medication started as inpatient (e.g. low-molecular weight heparin for the treatment of thromboembolic events), identification of potential drug interactions (e.g. paroxetine and ondansetron) and need for medication (e.g. azathioprine stopped before initiation of Rituximab).

In March 2019, an order for Gefitinib, which would have triggered an invoice of approximately £15,000 according to a Patient Access Scheme, was returned timeously to the supplier, thus avoiding a charge to the organisation. Items returned into stock included supportive care medication and suspended SACT were valued at £488.86 and £1321.45, respectively, in April 2019.

Interestingly, an improvement initiative by the MMT involving the creation of a pharmacy diary of new patients greatly optimised the pharmacists' workflow in the chemotherapy suite. Anecdotal feedback from both patients and nursing staff on the impact of the MMT has been very positive.

Conclusion/recommendations: The role of the MMT is rapidly evolving to support oncology pharmacy practice. The MMT's contribution to the outpatient chemotherapy suite included patient and carer education, taking accurate medication histories, cost-avoidance/savings, improving workflow by freeing pharmacist time and quality improvement. The introduction of the MMT has demonstrated not only improvements in general productivity and efficiency but also reducing drug expenditure. Generalisability may be limited due to exploratory nature of the project. Further work is needed to evaluate the impact of MMTs. National policy and guidance are needed for MMT education and training and career pathways to promote standardisation and further enhancement of these novel roles in cancer services.

034

Implementation of a pharmacist-led oral systemic anti-cancer therapies clinic

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Objective/purpose: The local outpatient chemotherapy unit (OCU) was exceeding its capacity due to an increase in the number of patients starting cancer treatment. It was becoming increasingly challenging to accommodate all appointments. The effectiveness of nurse- and pharmacist-led oral systemic

anti-cancer therapies (SACT) clinics has been demonstrated in the literature. A weekly pharmacist-led oral SACT clinic for solid tumours was set up to relieve the capacity in the OCU. The aim of the project was to evaluate the impact of the oral SACT clinic.

Study design/methods: A standard operating procedure was developed to clarify roles and responsibilities and describe the oral SACT clinic pathway to ensure a safe and effective service. Two pharmacist independent prescribers were identified to run the clinics supported by nursing and medical colleagues. Prospective data collection between October 2018 and April 2019 included patient demographics, number of patients scheduled, attendance details, diagnosis and regimen details and number of referrals to the OCU medical and nursing team for further assessment. Data were recorded on an Excel spreadsheet and analysed using descriptive statistics. The Clinical Chemotherapy Service Group approved the implementation of the oral SACT clinic.

Results/key findings: Between October 2018 and April 2019, 44 patients received 139 consultations in the oral SACT clinic; mean age = 71.5 (range 38–86) years; 24 (54.5%) male. Forty one per cent (n = 18) of patients attended from cycle 1. The clinic appointment slots were changed in December from 8 (20 min each) to 6 (30 min each) to improve patient and staff experience. Pharmacists provided person-centred consultations for 78% (n = 133) of booked appointments (n = 171). Duplication of appointments during the set-up of the service resulted in wasted appointments. This has improved over time as staff became familiar with the new clinic. Oral SACT prescribed for prostate (32%), colorectal (27%), breast (23%) and lung (18%) cancers included capecitabine (n = 15), enzalutamide (n = 11), palbociclib (n = 4), abiraterone (n = 3), Lonsurf® (n = 2), everolimus (n = 1), topotecan (n = 1) and tyrosine kinase inhibitors (TKI) (n = 7) (e.g. alectinib, afatinib, crizotinib, ceritinib and gefitinib). Pharmacists referred 27 (19.4%) cases to other healthcare professionals for further monitoring, toxicity management or response evaluation. A common intervention involved counselling patients and carers on herb–drug interactions with oral SACT. The introduction of the clinic also allowed the safe supply of two cycles of treatment in a single visit for stable patients (n = 5) when approved by the consultant oncologist.

Conclusion/recommendations: The findings demonstrated that the introduction of a pharmacist-led oral SACT clinic successfully freed capacity in the OCU, enabling more patients to be treated overall. The clinic facilitated the delivery of patient and carer education, timely monitoring and follow-up of oral SACT as per protocol. It also enabled fewer hospital appointments and improved patient experience. Clinical applicability may be limited due to small sample size and short duration of assessment. Evaluation of healthcare professional and patient experience is underway. The feasibility of introducing non-medical prescribing in the oral SACT clinic will be explored in the future.

035
Assessing feasibility of safely administering high-dose methotrexate-based therapy on an outpatient basis within a haematology ambulatory unit

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Objective/purpose: High-dose methotrexate (HDMTX)-based chemotherapy is indicated as part of treatment protocols for acute lymphoblastic leukaemia (ALL) and non-Hodgkin lymphomas (NHL). Different protocols use various doses and duration of administration. In our current practice, patients are electively admitted for the administration of concurrent hydration, folinic acid rescue with 30 mg every 3 h for five doses, then every 6 h until methotrexate level is less than 0.1 μmol/L, urine alkalinisation and daily therapeutic drug (TDM) monitoring until clearance.

The aim of this study is to assess the feasibility of administering HDMTX safely through an ambulatory service. Before implementing this new approach, the objectives were to assess the median time to MTX clearance and frequency of weight gain (as a surrogate for fluid overload) to facilitate patient monitoring and management, evaluate resource implications, i.e. duration of inpatient stay and re-admissions rates.

Study design/methods: This was a retrospective review of haematology patients with a diagnosis of ALL, NHL and primary central nervous system lymphoma (PCNSL) who received HDMTX chemotherapy between January 2015 and January 2018. HDMTX protocols were included either as monotherapy or combination regimen. HDMTX administered in

different doses; 3 mg/m^2, 2.5 mg/m^2 and 1 g/m^2 and infusion durations; 3 h or 24 h were included. Patients who received HDMTX for solid tumours were excluded.

Data were extracted from electronic prescribing and medical records. The median time to methotrexate clearance was calculated from the time of starting HDMTX infusion until MTX levels were <0.1 μmol/L and compared for the 3-h and 24-h infusion.

Results/key findings: A total of 71 patients were included in the analysis; median age was 57 (19.6–79.8) years. Forty-seven (66%), 12 (17%) and 12 (17%) had a diagnosis of NHL, ALL and PCNSL, respectively. Patients received a total of 159 courses of HDMTX; 12.7%, 69% and 18.2% of patients received 1, 2, and ≥3 cycles, respectively; 116 (73%) and 43 (27%) infusions were over 3 h and 24 h, respectively.

The median time to methotrexate clearance was 72 h (range 24–144 h) for the 3 h and 72 h (range 48–216 h) for the 24-h infusion. Six patients had delayed clearance due to renal impairment, pre-existing oedema, and/or pleural effusions. Weight gain within five days of starting HDMTX was observed in 116 (72%) episodes.

The median duration of inpatient stay was five days; 70 (44%), 50 (31%) and 39 (24%) required inpatient admission of less than four days, up to seven days and more than seven days, respectively. The total rate of re-admissions following HDMTX therapy was 22%. Readmissions were mostly related to neutropenic sepsis and infections.

Conclusion/recommendations: This evaluation of HDMTX administration in haematology patients demonstrated that HDMTX is cleared within 72 h in most patients. Weight gain secondary to hydration is common and could be managed as per institutional protocols. HDMTX could be safely administered on an ambulatory basis with careful patient and regime selection. Ambulatory delivery has the potential to save inpatient bed days, provide a convenient service for patients and the healthcare system.

036

Utilization of chronic disease medications in early-stage breast cancer survivors: An observational study

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Objective/purpose: Early-stage breast cancer (ESBC) survivors may be at an elevated risk of developing comorbidities due to the multiple underlying risk factors. Currently, limited studies examined medication usage for chronic diseases late into the survivorship phase in cancer survivors. This study aims to describe the medication usage up to four years after ESBC survivors' treatment.

Study design/methods: This is a retrospective observational study of a cohort of ESBC survivors who received treatment at the National Cancer Centre Singapore between November 2011 and September 2015. ESBC survivors were included if they (i) were aged 21 years or above, (ii) were able to read and understand either English or Mandarin, (iii) received a diagnosis of ESBC from a medical oncologist and (iv) completed primary treatment. Survivors were excluded if they experienced breast cancer recurrence or developed secondary malignancies. Medication data were extracted from electronic health records band and were classified using the World Health Organization Anatomical Therapeutic Chemical (ATC) classification. Medications were further categorized according to the corresponding chronic diseases: cancer, osteoporosis, type 2 diabetes mellitus (T2DM), hyperlipidemia and cardiovascular diseases.

Results/key findings: A total of 231 ESBC survivors were analyzed with a mean age of 56.4 ± 8.8 years were followed up for a median duration of 3.5 years. Majority were Chinese (81.0%) and received endocrine adjuvant therapy (79.7%). Among ESBC survivors who developed osteoporosis during follow-up, 52.0% and 61.8% were on preventive medication for recipients of tamoxifen and aromatase inhibitors, respectively. After osteoporosis diagnosis, 20.6% received pharmacological therapy. In a subgroup of patients with complete data up to four years after treatment (n = 112), hyperlipidemia medication usage increased from 9.8% at baseline to 14.3%; cardiovascular disease medication usage increased from 13.4% to 16.1% and T2DM medication

usage increased from 2.7% to 6.3% after 4 years. Majority (79.5%) of the survivors were not on medications for the three studied comorbidities four years after treatment.

Conclusion/recommendations: We observed an increase in chronic medication usage after primary treatment of cancer. There are important roles that pharmacists can play to reinforce the use of preventive medications for osteoporosis and manage survivors' risk profile for other comorbidities.

037

A comparative audit of the treatment and management of febrile neutropenia

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Objective/purpose: Febrile neutropenia is a frequent complication of chemotherapy for cancer. In 2015, an audit was undertaken to review the treatment and management of patients admitted to two metropolitan hospitals in Adelaide with febrile neutropenia. Changes were implemented as a result, and a new statewide guideline was also published. The aim of this follow-up audit was to review the treatment and management of patients admitted to the same two hospitals with febrile neutropenia over a six-month period in 2018 and compare these to the results of the 2015 audit.

Study design/methods: Case notes were obtained and reviewed for all patients admitted to two metropolitan hospitals in Adelaide with febrile neutropenia from 1 February 2018 to 31 July 2018. Patient demographics, admission time and date, initial presentation (including temperature, CBE and GFR), treatment and outcomes were collected. The data were then analysed to determine how many patients were treated according to the SA Health Febrile Neutropenia Management (Adults) Clinical Guideline.

Results/key findings: A total of 37 patients were admitted with suspected febrile neutropenia from 1 February 2018 to 31 July 2018. Of the 30 patients directly admitted to either hospital, 26 (87%) had their temperature taken within half an hour of presentation. This is the same as that experienced in the 2015 audit. Four patients (13%) received antibiotics within 30 min of presentation, and an additional 6 (20%) received antibiotics within 1 h of presentation, giving a total of 10 patients (33%) receiving antibiotics within 1 h of presentation. This was an improvement on the 2015 audit, where 7% of patients received antibiotics within 30 min of presentation. The average time to antibiotic treatment was 2 h and 54 min (range: 11 min to 10 h 52 min).

Thirty-three patients received piperacillin/tazobactam. Twenty-eight patients (85%) received the correct dosing. This was an improvement on the 2015 audit, where 62.5% of patients received the correct dosing.

In the updated guideline, gentamicin is recommended only for patients with signs of sepsis. Twenty-one patients received gentamicin. One patient was excluded from analysis due to lack of information regarding height and weight. Only four patients in total presented with documented signs of sepsis, and all received gentamicin. Of these four patients, only one (25%) received a dose correct for their GFR. This is approximately the same as the 2015 audit, where 27.5% of patients received the correct dose. The remaining three patients (75%) received a dose at least 20% lower than that recommended. Of the 16 patients who received gentamicin with no documented signs of sepsis, 5 (31%) received a dose greater than 20% higher than the recommended dose for their renal function.

Conclusion/recommendations: This audit showed an improvement on the 2015 audit in the prescribing of piperacillin/tazobactam; however, time to antibiotics and gentamicin dosing still requires improvement. These areas should be the targets for quality improvement and may be improved by increasing education of emergency department staff and patients.

038

Liver toxicity of abiraterone on a modified monitoring regimen used at the Royal Marsden Hospital

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Objective/purpose: Abiraterone can cause alanine transaminase (ALT) elevation, most commonly within three months of therapy initiation – fortnightly monitoring during this period is advised in the summary of product characteristics (SPC). For pragmatic reasons, at the Royal Marsden Hospital, patients are monitored fortnightly for the first

month, then monthly thereafter. The aim of this audit was to determine the safety of this modified monitoring regimen. The objectives are to:

1. Identify the incidence of grades 3 and 4 ALT elevations;
2. Determine when abiraterone-induced ALT elevation occurs;
3. Assess the clinical management of ALT elevation and outcome.

Standard: The incidence of ALT elevation should be no greater than in published trials.

Study design/methods: A total of 125 patients were prescribed abiraterone between 1 April 2017 and 31 March 2018; three clinical trial patients were excluded. Data were collected from patients' electronic records.

The incidence of CTCAE v5 grades 3 and 4 ALT elevation, within five months of therapy initiation was recorded and its management was compared to SPC recommendations. The data collection tool is available upon request.

The study was approved by the Trust Clinical Audit Committee. Ethics approval was not required.

Results/key findings: Four patients (3.2%) had a grade 3 ALT elevation; no grade 4 elevations were observed. This compares favourably with 6% grade 3 or 4 ALT elevation in clinical trials.

ALT elevation was identified during cycle 1 for one patient and cycle 2 for three patients; their management varied. One patient chose to switch to enzalutamide – it is not clear whether this choice was initiated by the medical team or the patient. Two patients had two-week treatment delays; one resumed at full dose, the other at dose reduction. The last patient continued at full dose with no treatment break. These patients had no further grade 3 or 4 ALT elevation, despite the differing management of their ALT elevation.

Impact on healthcare resources

For the 122 patients in this dataset, the impact on healthcare resources of this modified monitoring regimen was:

- Two additional clinic visits were avoided per patient, saving £36,978.20;
- Two additional biochemistry blood tests were avoided per patient, saving £1464.

Conclusion/recommendations: The incidence of grade 3 and 4 ALT elevation was 6% in phase 3 clinical trials compared to 3.2% incidence of grade 3 ALT elevation in this audit – none of these patients experienced any lasting liver dysfunction. Therefore, the modified monitoring schedule is safe and does not increase risk to patients.

Limitations: Eleven patients (8.8%) in the dataset had two monthly monitoring within the first five cycles – it cannot be ascertained whether this reduced monitoring would result in reduced identification of transient grade 3 or 4 ALT elevations. However, if these were transient and asymptomatic, it could be argued that there would be no added benefit of identifying them, as the patient did not come to any harm.

Recommendations

- Continue current monitoring schedule
- Create a treatment protocol to standardise the management of ALT elevations
- Re-audit locally, network-wide and nationally to expand evidence base

039

A pharmacy-led pharmacovigilance program for multiple myeloma patients at the Moi Teaching and Referral Hospital: A five-year experience

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Objective/purpose: Multiple myeloma (MM) is an incurable hematological malignancy and is the fifth most commonly seen malignancy at the Moi Teaching and Referral hospital (MTRH). Due to limited resources in our setting, the thalidomide-dexamethasone (Thaldex) regimen is used as first-line treatment for MM patients. The Thaldex regimen carries a considerable risk of adverse drug reactions (ADRs) such as peripheral neuropathy, thromboembolism and teratogenicity. The aim of this pharmacovigilance program was to identify the incidence of ADRs among MM patients on Thadex, to identify the most common ADRs associated with Thaldex and the outcomes of the ADRs.

Study design/methods: This was a five-year prospective single center study done at the MTRH from 2013 to 2018. An ADR monitoring tool was used to collect ADR information from patients either face to face, through phone calls by the pharmacist or by collecting information from patients' files. The information was fed into a spreadsheet and descriptive statistics were used to analyze the data.

Results/key findings: A total of 128 patients were enrolled and followed up. This comprised of males 60% (n = 77) and female 40% (n = 51). Mean age at diagnosis was 56 ± 10.2 years (range: 27–83 years). Mean age for males was 56.06 ± 1.25 and mean age for females was 56.54 ± 1.10. A total of 101 patients (78.9%) reported experiencing at least one ADR. The most common ADR reported was constipation 10.6% (n = 82). Others were fatigue 10.1% (n = 78), dizziness 8.8% (n = 68), peripheral neuropathy 8.8% (n = 68), headache 8.7% (n = 67) and loss of appetite 7.4% (n = 57). Most patients felt that the symptoms were treatment related. A total of 48 patients were hospitalized as a result of an ADR.

Conclusion/recommendations: A functioning pharmacovigilance program in oncology is important in understanding ADR patterns in the African setting. Health workers will be better prepared to counsel patients on what to expect and management of the ADRs. This can translate to better patient adherence to treatments.

040

The effectiveness of collaboration between oncology pharmacists and anesthesiologists for cancer pain managements in a medical center in Taiwan

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Objective/purpose: To evaluate the effectiveness of collaboration between oncology pharmacists and anesthesiologists for improving the quality in pain control management for cancer patients.

Study design/methods: The oncology pharmacists collaborated with anesthesiologists and started ward rounding since June 2018. The criteria of included subjects were (1) inpatients with active cancer and (2) having a pain score above 3 at least once per day and continuing for three days. The team visited the patients every Tuesday and Friday. They assessed the cause, location, intensity and frequency of current pain and pain management, discussed with the attending physicians and provided suggestions. The initial pain management, intervention and pain score after first visiting were documented. We defined the period from June 2018 to January 2019 as the study period. We selected patients with the same criteria in the period from November 2017 to May 2018 to be the comparison group. The primary outcome was the percentage of patients whose pain relieved within seven days.

Results/key findings: A total of 642 and 576 patients with at least once pain score above 3 during the admission period in the study period and comparison period were identified. Among the population, 71 (11.1%) and 77 (13.4%) subjects had a pain score above 3 at least once per day and continuing for three days. Fifty-six (72.7%) patients in comparison group got pain relief within seven days. During the study period, the percentage of patients getting pain relief within seven days was 78.9%. The rates of patients with pain relieving within five days were 31.0% and 31.2% in the study and comparison groups, respectively. During the study period, the rate of intervention from attending physicians within four days increased from 55.9% in the third quarter to 87.5% in the fourth quarter in 2018. A total of 31 suggestions were made. The most suggested was dose adjustment (38.7%), followed by medication change (32.3%) and adding medications (22.6%).

Conclusion/recommendations: The collaboration between oncology pharmacists and anesthesiologists for cancer pain management was effective to increase the rate of pain relief within seven days in patients with poor pain control.

041

Real-world experience of cabozantinib in patients with renal cell carcinoma and cost saving from a free of charge access scheme

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Objective/purpose: Cabozantinib is a tyrosine kinase inhibitor licensed for advanced renal cancer (RCC). Prior to routine availability in NHS Scotland[1] (June 2017), cabozanitinib was available for patients with RCC, following prior vascular endothelial growth factor targeted therapy, via a managed access programme (MAP) funded by Ipsen. Within the pivotal METEOR[2] study, cabozantinib was associated with a progression-free survival (PFS) of 7.4 months (primary outcome) and a median overall survival of 21.4 months (secondary outcome). We aimed to evaluate outcomes from early experience with cabozantinib in our centre and to identify any potential cost savings from participation in the MAP.

Study design/methods: Data were collected from clinical notes for all patients initiated on cabozantanib between October 2016 and December 2017 within the West of Scotland Cancer Network (WoSCAN). Data included initial Heng and Motzer scores, line of treatment, duration of treatment and overall survival. Data were analysed in August 2018 which served as the censor date for those still alive. Statistical analyses were performed within R® using Kaplan-Meier method (KMM).

To estimate potential cost savings, we compared the costs of cabozantinib stock with the equivalent duration of alternative agents, i.e. axitinib second line or everolimus third line. All prices were based on current BNF costs exclusive of VAT or any discounts. Patients were assumed to have received full-dose axitinib or everolimus and those receiving cabozantinib beyond third line were assumed to have been otherwise offered best supportive care.

Results/key findings: A total of 48 patients were treated with cabozantanib, 28 within the MAP. Median follow-up was 9.5 months (0.9–21.2). Seventeen patients were still alive at census date. The median duration of treatment was 5.3 months (95% CI 4.1–8.9), and the median OS was 9.6 months (95% CI 8.1–16.6 months). For the 28 patients who received cabozantanib within the MAP, the value of cabozantinib supplied was £948,865. The equivalent cost for second line axitinib (n = 14) or third line everolimus (n = 11) was £585,298.

Conclusion/recommendations: Duration of therapy and overall survival were less than reported in the clinical trial. The provision of cabozantinib free of charge within a MAP for 28 patients resulted in an estimated cost saving of nearly £600,000 compared to standard second or third line treatment options at the time. These estimated savings assume equivalent duration of therapy and do not include discounts or the service impact costs of administering the MAP. Such real-world data can be useful for patients and clinicians for making treatment decisions. Information relating to potential cost savings may be useful to the service.

Funding: National Health Service Scotland.

042
Long-term role of denosumab in the management of advanced or metastatic giant cell tumour of the bone

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Objective/purpose: Denosumab is a fully-human monoclonal inhibitor of RANKL-mediated osteoclast activation which was approved on the basis of two phase II clinical trials. Overall, 529 patients were enrolled, averaging an objective response rate (ORR) of 72.5%. [1, 2] The long-term efficacy and safety as well as the optimal duration in the adjuvant and palliative settings remain unclear.

This study aimed at evaluating the efficacy and safety of long-term denosumab therapy in a cohort of patients who received denosumab for the management of advanced or unresectable giant-cell tumour of bone (GCTB).

Study design/methods: Patients who received 6+ cycles of denosumab therapy cycles for unresectable/metastatic GCTB between January 2012 and January 2019 in a tertiary care institution were retrospectively pooled from the electronic prescribing chemotherapy system (Chemocare®). The following information was collected: gender, age at diagnosis, tumour location, previous surgery, treatment intention and duration, calcium and vitamin D levels. Patients were stratified according to their previous surgical resection status. Efficacy outcomes: ORR and progression-free survival (PFS); safety outcomes: occurrence of any denosumab-related side effects.

Results/key findings: Eight patients were included (baseline characteristics in Table 1). Denosumab was prescribed as per package insert in all but two patients, who received 60 mg four and eight weekly, respectively, due to poor tolerability. *Efficacy*: objective response was achieved in all patients (stable

disease in seven patients and radiographically documented remission in one). One patient experienced progressive disease after 21 months. Overall PFS = 33.4 ± 13.96 months (43 vs. 20 months in patients with and without previous surgical resection, respectively). *Toxicity*: No episodes of osteonecrosis of the jaw or any other grade 3+ toxicities observed; only two patients reported side effects attributable to denosumab (grade 1 dizziness, fatigue, and nausea in one case and site-of-administration pain in the other), albeit just one required treatment break and further dose reduction. Mean corrected calcium levels: 2.46 mmol/L (2.2, 2.67) pre-initiation vs. 2.16 mmol/L (2.06, 2.33) during therapy; vitamin D levels: 47.35 nmol/L (10.5–102.2 nmol/L) pre-initiation, and 54.46 nmol/mL (19.2–139.4 nmol/L) during therapy.

Age at diagnosis:	31
Female rate	62.5%
Treatment duration	32 months (7–87)
Previous surgery	50%
Location	Sacrum: 3; Femur: 3; Spine: 1; Radius: 1
Intent	Palliative: 5 Neoadjuvant: 2; Adjuvant: 1

Table 1. Baseline characteristics.

Conclusion/recommendations: In this cohort, all patients showed response to denosumab (PFS 33 months), and only one case of disease progression after 21 months. PFS in the adjuvant setting doubled that of the palliative setting, albeit this analysis was not powered to discriminate between subgroups. These results are consistent with other studies reporting similar ORRs. [3] At the closure of the observations included in this analysis, seven patients were still on active treatment. Anecdotally, there was no difference in terms of efficacy between patients who received full and reduced doses.

Denosumab was well tolerated, with no hypocalcemia episodes, and only one discontinuation due to toxicity (disease progression occurred whilst off-treatment, but new response was observed after re-challenge at reduced dose).

This study expands on the efficacy and safety profile of denosumab in the advanced and palliative settings, supporting its long-term use in patients who have exhausted other therapeutic options.

043

Risk stratification of neutropenic sepsis: Is the national early warning score (NEWS) equivalent to multinational association for supportive care in cancer (MASCC) score?

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Objective/purpose: To evaluate NEWS as a risk stratification tool in neutropenic sepsis when compared to the MASCC score with the aim of ensuring that the practice within NHS Grampian and NHS Scotland is safe. In the context of risk stratification of neutropenic sepsis, NEWS is an unvalidated tool.

Study design/methods: This was a single centred retrospective observational study over a six-month period based in NHS Grampian. Data were analysed for all adult patients treated for neutropenic sepsis secondary to cancer therapy (72 patients). We estimated the risk category, complication rates, misclassification rates and positive predictive value (PPV) using the MASCC score as the standard and comparing it to the NEW Score. A subgroup analysis was performed for oncology patients (41 patients). Equivalence was estimated using McNemars test.

Results/key findings: Risk stratification using NHS Grampian and NHS Scotland guidelines were not equivalent to the MASCC score ($p = 0.012$, $p = 0.001$). Subgroup analysis of oncology patients using NEWS was equivalent to the MASCC score ($p = 0.250$). Misclassification of low-risk patients as high risk was 43%, $p \leq 0.001$ using NHS Grampian. Misclassification of high risk as low risk was 80%, $p = 0.016$ using NHS Scotland guidelines. PPV for the low-risk group using MASCC score, NHS Grampian, NHS Grampian (solid tumours) and NHS Scotland guidelines were 88.5%, 84.0%, 84.0% and 70.8%, respectively. Complication rates were 10.8%, 16.0%, 16.0% and 29.3%, respectively.

Conclusion/recommendations: The MASCC score was the most accurate tool for predicting risk of complications. NHS Scotland guidelines underestimate risk with a high complication rate. NHS Grampian guideline as a risk stratification tool was a safe for determining risk and therefore treatment. NEWS <5 may be predictive of a better outcome in patients with solid tumours. NEWS may add value in predicting outcome when used with MASCC; this should be investigated in a larger population using NEWS2.

044

Investigating the use of thromboprophylaxis in day-case patients with multiple myeloma

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Objective/purpose: Multiple myeloma (myeloma) is a malignancy of the body's plasma cells. It is responsible for 15% of all haematological malignancies, and its prevalence is rising. The treatment of myeloma is complex and encompasses various options including stem cell transplant, chemotherapy and immunotherapy. Each comes with its own list of side effects including pancytopenia, infection and venous thromboembolism (VTE).

VTE includes both pulmonary embolism (PE) and deep vein thrombosis (DVT) and is the second leading cause of death in cancer patients, after the cancer itself.

Current guidance on VTE prophylaxis for day-case cancer patients on systemic anti-cancer treatment (SACT) is limited. This research therefore aims to explore the potential risk factors for VTE development in day-case myeloma patients receiving SACT and relate them to the current literature with a view to drawing comparisons, and the potential to develop a risk assessment tool.

Study design/methods: The investigation was a single-centre cohort study, where data were analysed retrospectively using both quantitative and qualitative methods. Seventy-nine day-case adult (18 years and above) myeloma patients that received SACT (oral, subcutaneous or intravenous) from January 2017 to August 2018, on the Laurel Suite Day-Case Unit at the Stockport NHS Foundation Trust, were included in the study. Exclusion criteria included patients diagnosed with monoclonal gammopathy of undetermined significance (a pre-myeloma condition), and patients transferred to Stockport NHS Foundation Trust during treatment of myeloma. Patients were selected regardless of treatment outcome or disease response.

An ethics application was submitted to the University of Keele; however, it was deemed as not required due to the exploratory nature of the research. An encrypted excel datasheet was used to collect the data, which only the researcher could access. After collection, the data were anonymized minimising the risk of exposing confidential patient information. The research question did not pose any patient safety risks. Patient consent was not required for the investigation as it was a retrospective investigation, which would not affect patient outcomes.

Descriptive and inferential statistics were used to analyse the data using Pearson's chi-squared tests and Welch's t-test.

Results/key findings: The results showed 7.6% of patients developed VTE whilst on SACT for myeloma. Comparison between these and the remainder of the cohort revealed that female gender was the only variable measured associated with VTE that showed statistical significance ($p = 0.0519$). However, trends were noted between risk and age, time since treatment started and type of treatment.

Conclusion/recommendations: This research suggested that links can be drawn between advancing age, female gender and treatment type with the development of VTE. However, this study needs to be continued with larger patient numbers to draw more robust conclusions, and aid development of a risk assessment tool for clinical practice.

Future work would look at a multi-centre approach, in real-time, over several years to ensure a more diverse study population. Patient ISS score and cytogenetics should be studied for VTE development links. Lastly, ways of scoring the identified VTE risk factors could be studied to aid development of a VTE risk assessment tool for myeloma patients receiving SACT for clinical use.

Funding: Stockport NHS Foundation Trust.

045

Pharmaceutical care in ambulatory pediatric oncology: Inventarisation of the needs by community pharmacists

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Objective/purpose: During their services in the hospital, clinical pharmacists involved in pediatric hemato-oncology (PHO) are often faced with information requests (dosages, formulations, etc.) by community pharmacists.

The aim of this study is to identify the needs of community pharmacists who are involved in the care of pediatric patients treated for a hemato-oncological condition.

Study design/methods: An electronic questionnaire (SurveyMonkey®) was used for intervention.

Community pharmacists contact data were collected by hospital pharmacists affiliated to three Belgian University Hospitals (Ghent, Leuven, Antwerp). An electronic link to the survey was sent to the community pharmacists by email (contact data provided by the parents) and analysis was performed in Excel.

Results/key findings: A total of 74 pharmacists were contacted to fill out the questionnaire (n = 41; Ghent, n = 24; Leuven; n = 9; Antwerp) over a period of two months. Two emails were non-deliverable.

A total of 16 pharmacists completed the questionnaire (response rate = 22.2%). Results showed that more than 80% of the participants had 10 years or more of experience as pharmacist. Most pharmacists (n = 11; 69%) had monthly contact with PHO patients. The majority of pharmacists (n = 11; 75%) indicated to have insufficient theoretical knowledge of the underlying pathology to give optimal pharmaceutical care to this population.

Therefore, 80% (n = 12) expressed the need for more background information about pediatric oncology by means of an e-learning tool, evening sessions or information leaflets. Information topics regarding pathology (symptoms, adverse events), treatment (duration, type of treatment, possible interactions with drugs and adverse effects) and safe handling of hazardous drugs (crushing, safety measures) were scored as highly relevant (>80%). Apart from the need for extra information, 50% (n = 8) of the community pharmacists would like to have a point of contact in the hospital, of whom 87.5% (n = 7) would prefer the ward designated clinical pharmacist as the contact person in the hospital.

Conclusion/recommendations: Although the response rate was rather low, it can be concluded that there is a (national) need by community pharmacists for more information about pediatric oncology treatments, pathology and safe handling of hazardous drugs. In addition, a contact person, preferably the designated ward pharmacist, is preferred. These needs will be further explored and actions will be defined in near future.

046

A review of immune checkpoint inhibitor therapy in Iceland: Indications and tolerability

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Objective/purpose:

1. To create an overview of the use and indications of monoclonal antibodies in the class of immune checkpoint inhibitors (ICPi) therapies (CTLA-4, PD-1 and PD-L1 inhibitors) for the treatment of cancer and hematologic malignancies at the Landspitali – The National University Hospital of Iceland.
2. To create an overview of the tolerability of treatment with ICPis with regard to the type and the grade of AEs.
3. To create an overview of the management of AEs in patients treated with ICPis.
4. To collect the incidence of AEs reported for the class of ICPi therapies to the Icelandic Medicines Agency.

Study design/methods: A single-center retrospective, descriptive chart review of patient cases who received at least one dose of nivolumab, pembrolizumab, atezolizumab or ipilimumab at the Landspitali – The National University Hospital of Iceland between 1 January 2015 and 31 December 2018.

The social security numbers of the patients were obtained from a central database through the department of finance and the drug and therapy committee at the Landspitali. All symptoms recorded by a physician in the medical records of patients during or after the ICPi treatment that could be classified as an AE related to the ICPi were recorded as possible AEs. The primary endpoint was the tolerability of ICPis including the incidence, type and severity of AEs. Secondary endpoint was the management of AEs associated with ICPis. The incidence of AEs reported to Icelandic Medicines Agency was also evaluated.

Results/key findings: A total of 135 patients were enrolled in the study. Fifty per cent of patients experienced a total of 114 AEs, of which 25% experienced AEs leading to discontinuation of ICPi therapy that can be classified as grade 3–4 AEs. The most common AEs were skin reactions, thyroid

reactions and general symptoms. Two patients died in relation to encephalitis after treatment with nivolumab. 66.2% of the patients who experienced AEs received steroids for the management of AEs, prednisolone being the most commonly used drug (62.9%). A total of seven AEs in seven patients were reported to Icelandic Medicines Agency between 2015 and 2018; all of them were associated with the ICPi nivolumab.

Conclusion/recommendations: This retrospective study indicates that the majority of AEs associated with ICPi therapy are manageable, as 75% of the patients who experienced AEs were able to continue on ICPi therapy. Nevertheless, it also indicates that these AEs can be severe, as 25% of the patients experienced AEs leading to permanent discontinue of ICPi therapy and two patients died because of encephalitis following treatment with nivolumab.

047

Review of the first year of a pharmacist-led breast cancer oral therapies clinic: A joint working project between The Christie NHS Trust and Novartis

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Objective/purpose: The study aims to evaluate the pharmacist-led clinic service for metastatic breast cancer patients. This clinic is located at the Christie outreach site in Wigan, Greater Manchester, UK.

This project has a non-medical prescribing (NMP) pharmacist in two clinics weekly clinically reviewing and prescribing for patients plus additional telephone reviews of patient receiving oral SACT (systemic anticancer therapy). This is a two-year pilot project working in partnership with Novartis and seeks to explore if an NMP pharmacist in clinic reviewing selected patients is able to provide additional benefit to the clinical team and patients.

Data have been collected at specified time points on pre-defined objectives as set out in the Joint Working Project Agreement with Novartis. They measure pharmacist consultations and prescribing activity, patient-reported satisfaction and clinic waiting times through the period July 2018–April 2019.

Study design/methods: Prospective data collection was from a single site from July 2018 to April 2019. Data were collected at baseline and then throughout the first year of the project.

The data on clinic and telephone appointments, prescribing activity were obtained from the medical notes and e-prescribing system and tracked throughout the project. Patient satisfaction and clinic waiting time were obtained via patient survey and 'snap shot' data collection at baseline and Month 10 (April 2019).

Results/key findings

Clinic activity:

- Pharmacist Clinic Consultations: 101 (Month 0: 0, Month 5: 5, Month 10: 26).
- Pharmacist Telephone Consultations: 100 (Month 0: 0, Month 5: 14, Month 10: 16).
- Number of SACT prescriptions prescribed by the pharmacist up to month 10 was 1190.
- Monthly pharmacist prescribing of SACT increased from 0 at baseline to 120 at month 10.
- Average patient waiting time in clinic has decreased by 9 min from a baseline of 35 to 26 min at Month 10.

Patient satisfaction:

- Overall patient satisfaction increased by 8.5% (baseline: 84.7%, month 10: 93.2%).
- Patient recommendation of the clinic for a relative or friend increased by 8.8% (baseline: 86.6%, month 10: 95.4%).
- Satisfaction with pharmacist consultations has increased by 5.7% (baseline: 87.5%, month 10: 93.2%).
- Patient satisfaction with pharmacist telephone consultations has increased by 3.2% (baseline: 88.8%, month 10: 92%).
- Patient satisfaction with waiting times has increased by 2% (baseline: 77%, month 10: 79%).

Conclusion/recommendations: These data demonstrate a clear benefit to both the clinical team and patients. The burden on clinics as well as patients has been reduced, patient satisfaction increased and waiting times improved. Running in parallel to the medic-led clinic also provides reassurance for patients and clinicians in regard to the safety of a pharmacist-led clinic in this population.

The project will seek funding beyond the pilot phase and expansion to other sites within the network.

It can serve as a proof of concept and a template to other centres wishing to utilise pharmacist NMPs to meet the growing demands, as the range of oral oncology treatments increases further.

Funding: None. My current post working in this pilot project is 50% NHS funded and 50% commercially funded by Novartis, under the terms of the Joint Working Project.

048

Evaluation of palbociclib usage in patients with metastatic breast cancer at the North West Cancer Centre, Altnagelvin Area Hospital

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Objective/purpose: Palbociclib was first used in the North West Cancer Centre (NWCC) in November 2017. The aim of this evaluation is to compile accurate data relating to the use of palbociclib in the NWCC and to compare it with the PALOMA-2 clinical trial data.

Study design/methods: The first 12 patients to commence palbociclib in the NWCC were included in the evaluation and followed up until April 2019. Follow-up was stopped earlier if patients stopped treatment due to disease progression or unacceptable toxicities. The following data were extracted from the RISOH prescribing system: appropriateness of palbociclib (previous disease, previous treatments, ER/HER2 status), concomitant use of an aromatase inhibitor, neutrophil and platelet results at Day 1 (also Day 15 and Day 22 if appropriate during early cycles), number of deferrals and dose reductions, timing of CT results and evidence of treatment benefit.

Results/key findings: Among the evaluation group, 25% had newly diagnosed metastatic breast cancer, 58% had a disease-free interval >12 months before presenting with metastatic disease, 8% (one patient) had a disease-free interval of <12 months, and 8% (one patient) had several previous treatments for metastatic disease but received palbociclib via an Individual Funding Request. Forty-two per cent had received adjuvant chemotherapy and 66% prior adjuvant endocrine therapy. These figures suggest that palbociclib patients in the NWCC have a similar background of prior disease and treatments to those in the PALOMA-2 trial.

At the end of the evaluation period, seven patients (58%) were continuing treatment (average 8 cycles), and CT results showed stable disease, partial response or a mixed response. The median progression-free survival (PFS) was 30 weeks (approx. 7.5 months), as evaluable during the study period. This was much lower than the trial (24.8 months) due to the shorter study period, but 58% of patients continue on treatment and a longer overall PFS is anticipated.

Fifty-eight per cent of patients developed thrombocytopenia, but generally this did not exceed Grade 1. Two patients (17%) developed Grade 3/4 thrombocytopenia and required treatment deferral. Neutropenia occurred much more frequently (83%). Grade 3/4 neutropenia occurred in 50% of patients. The incidence of neutropenia and thrombocytopenia was similar to the PALOMA-2 trial; however, this did not translate into a similar frequency of dose reductions (DRs). All patients in this evaluation who continued on treatment required one or two DRs, but in the trial only, 36% of patients required DRs. Deferrals and DRs were assessed for appropriateness, based on blood results and other documented non-haematological toxicities. Two DRs could have potentially been avoided. This evaluation only included a small first group of patients and may not be representative of all patients treated. Prescribers may also have been more cautious when using palbociclib initially.

Conclusion/recommendations: Prescribers will need clear, easily accessible guidance to prevent unnecessary DRs. It is reassuring that all patients continuing on treatment received one or more DRs and have demonstrated stable disease, or a partial or mixed response. PFS cannot be compared with the trial at this stage, and re-evaluation of these patients in the future would provide more comparable data.

Funding: Western Health and Social Care Trust.

049

Multi-centre prospective audit of rapid infusion biosimilar rituximab in patients with haematological malignancies

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Objective/purpose: Rapid infusion rituximab using either a 60 or 90 min schedule has been widely introduced within chemotherapy units in the United Kingdom (UK) to minimise inconvenience for patients and optimise day unit capacity. Biosimilar rituximab was launched in the UK in April 2017; however, as with MabThera™, the biosimilars are not licensed in the UK for rapid administration in haematological malignancies.

We sought to establish the rate of infusion-related reactions (IRRs) to rapid infusion biosimilar rituximab.

Study design/methods: We established a multi-centre, prospective audit of IRRs to rapid infusion biosimilar rituximab, utilising a previously reported meta-analysis as the audit standard.[1] Data relating to patient demographics, diagnosis and product formulation were collated by each pharmacy department, and details of any IRRs were documented immediately after the infusion.

Results/key findings: Data from 116 rapid infusions of biosimilar rituximab (mostly Truxima™), given to 75 patients, during September 2017 to December 2018 were collated. The majority of patients had a diagnosis of lymphoma and were treated with R-CHOP chemotherapy. The median age of patients was 69 (25–94) years and median dose was 700 mg (range: 500–000 mg), surface area 1.9 m^2; (range: 1.41–2.59 m^2). All patients received pre-medication with anti-histamines and most with steroids.

The reaction rate was 1.7% of rapid infusions (Grade 1 or higher) – similar to that seen with MabThera™. The worst reaction was Grade 2.

Conclusion/recommendations: Our data should provide reassurance for clinicians using biosimilar rituximab that the incidence of IRRs remains low and comparable to the levels seen with MabThera™.[1] Our audit has limited numbers of doses of Rixathon™ or use of Chronic Lymphocytic Leukaemia, and therefore caution should be exercised in extrapolation of the data.

Funding: Polwart, Clarke and Taylor are currently seconded part-time to work with NHS England Specialised Commissioning Team. Polwart has received funding from Roche Products (Honoraria & Department funding through Joint Industry Working Agreement) and Napp Pharmaceuticals (Departmental funding for consultancy). All authors undertook the work as part of their NHS Employment.

Reference

1. Polwart C . Using meta-analysis to develop an audit standard for the rapid infusion of bio-similar rituximab. *J Oncol Pharm Pract* 2017; 23: 53.

050

Patients' awareness of drug–drug and drug–herb interactions with oral anticancer agents

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Objective/purpose: Cancer patients receiving oral cancer therapy frequently use concomitantly herbal supplements and over-the-counter (OTC) medications along with antineoplastic agents. These patients have risk of drug–drug interactions (DDI) and drug–herb interactions (DHI), which may lead to ineffective cancer therapy or increased risk of potential side effects. We aimed to assess patients' awareness of clinically relevant DDIs and HDIs with their oral anticancer therapy.

Study design/methods: We conducted an interview with cancer patients who were prescribed oral cancer therapy in Tartu University Hospital, Estonia. Only antineoplastic agents with clinically relevant interactions (DDIs with OTC medicines or DHIs) according to the summary of product characteristics were included. Patients were asked about the awareness of DDIs and DHIs with their cancer medicines and whether they have used OTCs or herbal products that may interact. We also asked whether they have been informed about potential interactions before the treatment and if yes, from which source they have received information.

Results/key findings: In this study, 30 patients were interviewed, with a median age of 67.8 years (range 36–87 years), of which 77% were female. The most commonly used oral cancer agent was gefitinib (23%) followed by erlotinib, olaparib, pazopanib and dabrafenib (10%); other agents were used in fewer cases. The median number of other drugs used per person was three (range 0–10 drugs). Sixty percent of patients were not aware of potential DDIs and DHIs with their therapy. Awareness was slightly better among those patients who have received their oral anticancer therapy longer than six months. We found out that 27% of patients used OTC medicines, which have clinically relevant DDI with oral anticancer agents. Sixty-three percent of those patients used either gefitinib or erlotinib concomitantly with omeprazole. These combinations should be avoided as omeprazole may reduce absorption of anticancer agent and therefore lead to diminished effect of cancer therapy. Sixty percent of patients stated that they have not received any information about potential DDI and DHI. Surprisingly, only 7% of those who had been informed about interactions before the treatment got this information from pharmacist. Doctors as information sources were mentioned more frequently (30%), some patients have sought information by themselves using either patient information leaflet or internet (23% and 13%, respectively). Additionally, 63% of the patients evaluated the information about their cancer medicines to be insufficient, and most of the dissatisfied patient reported that they lack information especially about interactions and side effects of their medications.

Conclusion/recommendations: Potential DDIs and DHIs are common among cancer patients on oral cancer therapy. Our findings showed that patients' awareness about those interactions is insufficient and they may use OTC drugs or food supplements along with cancer therapy that may lead to ineffective cancer treatment. According to our study, the pharmacists' role of consulting cancer patients about the DDIs and DHIs was insufficient. It should be encouraged in order to support the patient and improve the treatment outcome.

051

Prospective case record pharmacovigilance study of patients receiving intravenous treatment with trastuzumab biosimilar

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Objective/purpose: To examine the incidence of adverse reactions experienced by patients receiving intravenous trastuzumab biosimilar (Kanjinti®).

Study design/methods: All patients with prescriptions for intravenous trastuzumab (Kanjinti®) on the prescribing system IQEMO were identified on a weekly basis commencing from 30 October 2018 for a six-month period. This covered bot breast and GI disease groups and all sites (Christie and peripheral units) using IQEMO. Individual patient records were examined on the Christie clinical web portal (CWP) to confirm administration and to identify any adverse reactions recorded. An adverse event was defined as any event reported at the time of administration or within the 48-h period afterwards. This study received approval from the Christie clinical audit committee prior to commencement.

Results/key findings: One thousand individual prescriptions were identified as administered during the time period. This represented the treatment given to 235 individual patients: the majority of whom were female (221 vs. 14). Trastuzumab biosimilar was administered either as a single agent or in combination with other chemotherapeutic agents and/or monoclonal antibodies. As the switch to the biosimilar had been made in one go, patients may have been trastuzumab naïve or may have previously received a number of cycles with the originator.

A total of 25 events were recorded: on review, only eight were related to the biosimilar trastuzumab. These included infusional reactions (5), pain (1), extravasation (1) and heart failure (1). All infusional reactions occurred on cycle one (trastuzumab naïve), with the other events recorded at cycles 9, 12 and 20, respectively. All other events were considered to be related to the patient's disease or other treatment agents. This was a pharmacovigilance study of a medicinal product subject to additional (black triangle) monitoring. Staff reporting an adverse reaction to Kanjinti® were contacted and requested to complete a yellow card report of suspected adverse drug reaction to the MHRA.

Conclusion/recommendations: The summary of product characteristics for the originator (Herceptin®) lists the frequency for the occurrence of the adverse events identified as:

- hypersensitivity (common) 1 in 100 to 1 in 10
- pain (very common) 1 in 10
- extravasation – not given
- cardiac failure (common) 1 in 100 to 1 in 10

In no case has the frequency of the adverse events identified with the use of the biosimilar exceeded the frequency expected with use of the originator. All infusional reactions occurred in trastuzumab-naïve patients, showing that there is no requirement for extended monitoring in patients who have previously received trastuzumab.

This study has demonstrated that this biosimilar agent can be introduced without a requirement for increased monitoring, as the toxicity profile remains similar to the profile of the originator.

This study was limited by reliance on complete and accurate record keeping by third parties rather than by direct observation potentially resulting in incomplete or inconsistent data availability.

052

A cross-sectional survey on the unmet needs of informal caregivers supporting ambulatory cancer patients in Singapore

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Objective/purpose: Informal caregivers (ICs) supporting cancer patients are at increased risk of reduced quality of life, increased work and activity impairment, and psychological problems such as anxiety and depression, due to the immense burden of providing care and concurrently dealing with the possibility of losing loved ones. It is hence important to assess ICs' unmet needs to assist them for better well-being. The objectives of this study are to identify the most pressing needs of ICs supporting ambulatory cancer patients receiving parenteral chemotherapy treatment in Singapore, and to describe characteristics of ICs that predispose them to different types of unmet needs.

Study design/methods: A cross-sectional survey was administered to 155 ICs (defined as the main person providing care) accompanying cancer patients for outpatient chemotherapy at the National Cancer Centre, Singapore. Survey sections included caregiver demographics, caregiving details, Barthel Index (BI) of activities of daily living, Zarit Burden Interview (ZBI), and Support Persons Unmet Needs Survey-Short Form. Descriptive statistics summarised survey scores, while chi-square tests and multiple logistic regressions were used to investigate caregiver characteristics associated with unmet needs.

Results/key findings: ''Dealing with worry about the cancer getting worse'' was the top reported unmet need ($n = 36$), from the domain ''The future.'' Information needs were associated with being employed and high caregiver burden. Work and financial needs were associated with age <45, being employed, and higher caregiver burden. Personal and emotional needs were associated with higher caregiver burden.

Conclusion/recommendations: There is a demand for cancer caregiving support in Singapore, especially regarding concerns relating to the future. Caregiver age, employment status, and ZBI can be used to predict unmet needs and individualise support plans.

053

Survey of profile and current practices of oncology pharmacists in Brazil

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Objective/purpose: The activities of oncology pharmacists in Brazil are not well documented. Our objective was to identify Brazilian oncology pharmacists profile and current practices in oncology pharmacy services.

Study design/methods: A national survey was conducted which contained 78 closed-ended and open-ended questions, was sent to 203,000 Brazilian pharmacists that included all specialties, not only oncology, by email. The survey assessed demographic characteristics, educational background and oncology pharmacy practices and was developed using the Survey Monkey© online platform. Data collection

occurred between October and November 2017. Only one survey per oncology pharmacist was requested.

Results/key findings: In all, 890 individuals responded. Most survey respondents were between 31 to 40 years of age (47.8%), female (71.0%) and lived in State of São Paulo (21.8%). Eight-two per cent had completed their pharmacy degree between 2001 and 2017, 49.9% did not have received training to work in oncology pharmacy during university, 17.4% did not have received any training before start working and 56.6% did not have a postgraduate degree in oncology pharmacy, or residency training program or any other certification. Of the respondents, 68.4% participated in scientific meeting at least once a year, 44.0% had already written and submitted an abstract for a scientific meeting, 24.1% had published a manuscript in a scientific journal and 45.4% had lectured in the field of oncology. Overall, 46.9% of the pharmacists have been working in oncology for less than five years, 60.3% practiced in a hospital, 80.3% were handling of antineoplastic and other hazardous drugs, 64.5% were order reviewing of all prescriptions, 91.7% were dispensing oral antineoplastic agents, 49.3% performed pharmacotherapy follow-up of patients, 58.5% participated in clinical rounds and 61.5% carried out periodic training with the care team.

Conclusion/recommendations: The survey made it possible to know the profile and status of the Brazilian oncology pharmacist's practices. The study results indicate that efforts are needed to improve the training and current practices of oncology pharmacists as well as increase the scientific production in Brazil.

054

Comparative efficacy and safety of multiple interventions for brain metastases in non-small cell lung cancer: A systematic review and network meta-analysis

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Objective/purpose: Lung cancer is the most common cause of cancer-related mortality worldwide. Approximately 80% of lung cancer patients were diagnosed as non-small cell lung cancer (NSCLC), and during the course of diseases, 20–40% of NSCLC will develop brain metastases which are deemed to be life-threatening conditions. Several pharmacological and non-pharmacological interventions are available for NSCLC with brain metastases; yet, the comparative effectiveness among interventions is limited.

The study objective is to compare and rank the efficacy and safety of available interventions for NSCLC with brain metastases.

Study design/methods: A systematic review and network meta-analysis were performed utilizing published literatures of randomized controlled trials (RCT) from their inception to 16 January 2019, from PubMed, Cochrane, Scopus, and CINAHL. We included placebo-controlled and head-to-head trials of eight interventions including: (1) supportive care (SC) (2) radiation (RT), (3) non platinum based -chemotherapy (CMT), (4) platinum-based chemotherapy (PT), (5) epidermal growth factors tyrosine kinase inhibitors (EGFR), (6) RT + CMT, (7) RT + PT and (8) PT + EGFR used for the treatment of adults (≥18 years old and of both sexes) diagnosed with metastatic brain NSCLC according to the international standard diagnostic criteria. We excluded observational studies and trials that were incomplete. The study of ALK-positive NSCLC was also excluded. Data extraction was performed following a predefined order. The literature' risk of bias was assessed in accordance to the Cochrane Handbook for Systematic Reviews of Interventions. Primary outcomes were efficacy (progression-free survival (PFS), overall survival (OS), overall response rate (ORR) and safety (occurrence of adverse events). We estimated mean differences on survival odds ratios (ORs) on response using pairwise and network meta-analysis with random effects.

Results/key findings: A total of 713 articles were identified. Of these, 18 RCTs comprising of 2755 patients were included. Among several interventions, PT + EGFR was ranked the most efficacious intervention in prolonging PFS with mean difference (MD) of 3.10 months (95%CI 1.88, 4.32), 6.44 months (95%CI 4.75, 8.14), 7.98 months (95%CI 6.56, 9.41), 6.62 months (95%CI 4.71, 8.52) and 9.74 months (95%CI 7.64, 11.85) as compared with that of SC, RT, PT, RT + CMT, and RT + EGFR, respectively. For OS outcome, PT demonstrated the

most efficacious with MD of 3.25 months (95%CI 0.42, 6.08) as compared with that of a reference intervention, SC. As ORR outcome, PT + EGFR is superior to SC, and PT alone with OR of 6.44 (95%CI 1.13, 36.76) and 27.86 (95%CI 3.98, 195.11), respectively. In terms of safety, RT + CMT appeared to be the greatest toxic intervention as fatigue, nausea, vomiting and anemia were reported of highest frequency, while EGFR-TKIs appeared to be the least toxic interventions.

Conclusion/recommendations: Among several interventions, PT in combination with EGFR-TKIs appeared to be the most efficacious in improving PFS and PT demonstrated the most efficacious in improving overall survival among NSCLC with brain metastases.

Funding: Khon Kaen University, Faculty of Pharmaceutical Sciences, 2018 Special Project Grants.

055

Neutropenic fever management among pediatric patients with cancer at Tikur Anbessa Specialized Hospital

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Objective/purpose: The study aimed at assessing the management practice of neutropenic fever (NF) in pediatric patients with cancer at the Tikur Anbessa Specialized Hospital (TASH), Ethiopia.

Study design/methods: A retrospective cross-sectional study design was employed at the TASH in 135 pediatric patients with cancer. Data were collected from patients' charts from 2 to 16 May 2018 in those who were admitted to pediatric oncology ward of the hospital between 1 January 2016 and 31 December 2017. All patients with NF and stayed in the hospital at least two days were included in the study, and those readmitted with recurrent NF were excluded from the study. Data were entered into Epi-info 7 and exported to SPSS 20 for analysis. Ethical clearance was obtained from the ethical review board of the institution, and official support letter was written to study site.

Results/key findings: Focus of NF infection was unknown in most of (84.5%) of study participants. In 88.9% of participants, absolute neutrophil count (ANC) value was less than 500 cell/mm^3 and 85.9% of patients fulfilled diagnostic criteria of NF. Empiric antibiotics therapy (EAT) was given in all patients, in which ceftriaxone with gentamycin constituted of 71.9% followed by ceftriaxone monotherapy. The mean treatment duration of NF was 9 ± 5 days. Culture and sensitivity test was done only for 13 (9.6%) of the participants and bacterial growth was seen only in five patients and definitive therapy was given only for two patients. ANC value was above 500 cell/mm^3 in 80.7% of patients, and 98.5% of study participants were afebrile after completion NF treatment. Most of them (70.4%) were treated for NF and seven of patients died due to all-cause mortality.

Conclusion/recommendations: All patients received EAT for management of NF. Ceftiaxone with gentamycin is the most popular EAT combination used in study population. The hospital should not rely mainly only on ceftriaxone with gentamycin as EAT and should do culture and sensitivity test to optimize therapy based on susceptibility result before conversion and modification of therapy.

056

Impact of chemotherapy regimen type on plasma DHEA(S) and cognitive function in early-stage breast cancer patients

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Objective/purpose: Dehydroepiandrosterone and its sulfated form, jointly referred to as DHEA(S), are neurosteroids known to regulate brain development and function. It is hypothesized that reduced plasma DHEA(S) levels could lead to onset of cancer-related cognitive impairment (CRCI) among patients. The objective of the study is to evaluate the impact of chemotherapy regimen type on plasma DHEA(S) levels and cognitive function in early-stage breast cancer patients.

Study design/methods: In a prospective cohort study, self-perceived and objective cognitive function of patients were assessed over three time points: baseline (T1), during (T2) and after chemotherapy (T3). At each time point, plasma samples were assayed for

quantitative determination of DHEA(S) levels. Based on the type of chemotherapy regimen, Mann-Whitney U test was used to compare plasma DHEA(S) levels between patients who received anthracycline-based and taxane-based chemotherapy. Generalised Estimating Equation was used to evaluate the longitudinal association between plasma DHEA(S) levels and CRCI, adjusting for clinically relevant factors.

Results/key findings: A total of 81 patients (mean age ± SD = 48.9 ± 9.3 years; 66.7% receiving anthracycline-based chemotherapy) were analysed. 27.8% of patients reported experiencing CRCI based on global FACT-Cog scores. Comparing to baseline values, a reduction in overall median plasma DHEA(S) level had been observed (DHEAS at T1: 1.45 μmol/L vs. T3: 1.07 μmol/L, $p < 0.001$; DHEA at T1: 15.61 nmol/L vs. T3: 12.73 nmol/L, $p = 0.67$). The extent of reduction in DHEA(S) levels varies between the types of chemotherapy regimen: levels of DHEAS and DHEA were reduced by 28.7% and 24.3% from baseline, respectively, for patients receiving anthracycline-based chemotherapy, while reduction of DHEAS and DHEA levels was 38.0% and 8.1%, respectively, for patients receiving taxane-based chemotherapy. However, there were no statistically significant differences in plasma DHEA(S) levels between patients receiving different types of chemotherapy regimen. The type of chemotherapy regimen was also not found to be associated with patients developing CRCI. Nevertheless, lower DHEAS levels were found to be associated with higher odds of developing self-perceived cognitive impairment in functional interference (adjusted odd ratios (aOR) = 0.19, 95% confidence interval (CI) = 0.05–0.80).

Conclusion/recommendations: The type of chemotherapy regimen was not found to influence plasma DHEA(S) levels nor the odds of patients developing CRCI. However, reduced plasma DHEA(S) levels were observed in patients after receiving chemotherapy, with lower DHEAS levels found to be associated with higher odds of developing CRCI.

Funding: National University of Singapore (R-148-000-233-114; principal investigator A/Prof Alexandre Chan), National Cancer Centre Singapore (NRFCB12131; principal investigator A/Prof Alexandre Chan); National Medical Research Council (NMRC/CIRG/1386/2014 and NMRC/CIRG/1461/2017; principal investigator A/Prof Alexandre Chan).

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Incidence and management of hypoglycemia in patients receiving zoledronic acid in Kenyatta National Hospital

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Objective/purpose: To assess the incidence and management of hypocalcaemia in patients with malignancies on zoledronic acid.

Study design/methods: This was a retrospective study. Records of patients on bisphosphonates were reviewed for the period from January 2014 to December 2017. Sample size as determined using Fischer formula was 135. Convenience sampling was used. Data were collected on malignancy type, location of bone metastasis, the initial calcium before treatment and calcium after initiation of treatment. Any method used to manage hypocalcaemia was also noted. Data analysis was done using Microsoft Excel.

Results/key findings: Breast cancer patients represented 33.3% of the study population, with prostate and multiple myeloma representing 51.1% and 15.6%, respectively. 37.8% had metastasis at the ribs. Metastasis to the pelvis and vertebrae were 27.4% and 19.3% respectively. Metastasis to the skull was the least at 15.6%. Hypocalcaemia was present in 30% of the study population. In the 70%, a population contributing to 34.7% had their serum calcium reduced upon initiation of treatment, but the levels did not go below 2.2 mEq/L. It was noted that the patients still received zoledronic acid even when hypocalcaemic. Of the 30% (n = 35) of the patients that had hypocalcemia, 79% (n = 28) were not managed pharmacologically for the hypocalcaemia. For those that were treated, 12% (n = 4) were on vitamin D alone. In 6% (n = 2) of the population, vitamin D was combined with calcium, while 3% (n = 1) of the patients were being treated with calcium supplements.

Conclusion/recommendations: This retrospective study showed that the number of patients on zoledronic acid that developed hypocalcaemia after three courses was not high. Cancer of the breast, prostate and multiple myeloma were the only ones identified. Other cancers that may have bone metastasis such as lung, thyroid, renal cell are not very common and so could have been missed out during the sampling. It can also be noted that hypocalcaemia that

developed is hardly managed by the residents. Bisphosphonates are usually prescribed by residents on a routine basis and not by the oncologists who just set the treatment plans for the patients and then send them to the residents. It is thus important for the pharmacist to monitor these patients before they receive zoledronic acid so as to ensure the patient is treated for hypocalcaemia if it occurs and thus prevent symptoms of hypocalcaemia from occurring in the patient and improving the quality of life and also prevent delays in the administration of the drug. The clinical pharmacist should also conduct a Continuous Professional Development session on bisphosphonates and management of hypocalcaemia to the residents. A follow-up study can then be done to find out if there is an improvement in practice.

Funding: Source of funding was from the investigators.

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Investigating the use of complementary medicines taken by patients prior to systemic chemotherapy at a rural cancer centre

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Objective/purpose: There is often limited efficacy evidence regarding most complementary medicines and some have the potential to cause adverse reactions or interact with conventional medicine. The use of complementary medicines in Australia is considerable and increasing. As most studies are done in metropolitan areas, is this the consistent within rural communities?

Study design/methods: For the purpose of this study, the definition of a complementary medicine was a product used by the patient for a therapeutic benefit but not listed in Australian Medicines Handbook (2019) – thus excluding all vitamins and minerals. A retrospective review of 232 patient interviews conducted between July 2016 and April 2019 was done, where patients were specifically asked about complimentary medicine use. The name of the product and the number of patients taking a named product were recorded. Using the Therapeutic Research Centre's natural medicine database, the product was investigated to see if any interaction could be identified with chemotherapy.

Results/key findings: Fifty-nine patients (25%) admitted to recent use of complementary medicines, but 16 patients (7%) had already stopped them prior to interview. Within the group of 59 patients, 41 different complementary medicines were identified with an average of 1.7 per patient. Using the database, monographs were found for 36 out of the 41 products. There were 11 interactions listed with chemotherapy agents, but these were all the older agents and the only oral was erlotinib.

Conclusion/recommendations: The use of complementary medicines provides challenges in the face of in the changing face of modern chemotherapy especially with the emergence of oral targeted therapies which often use the CYP450 enzyme system for metabolism. Given the diverse range of complementary medicines currently used by patients in both metropolitan and rural communities, more research is required to provide health care professionals with more information to help clients make informed choices when undergoing systemic chemotherapy.

059

Severe adverse events of PD-1 and PD-L1 inhibitors in ongoing clinical trials

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Objective/purpose: PD-1 and PD-L1 inhibitors are now approved to treat malignant melanoma, non-small cell lung cancer and malignant lymphoma. In China, there are many ongoing clinical trials of PD-1 and PD-L1 inhibitors. Monitoring severe adverse events (SAEs) is an important part of these clinical trials. We conducted this study to evaluate the incidences and other characteristics of SAEs found in ongoing clinical trials of PD-1 and PD-L1 inhibitors and to compare the differences of SAEs between PD-1/PD-L1 inhibitors and provide references for pharmaceutical care.

Study design/methods: We analyzed the types and incidences of SAEs and fatal SAEs of ongoing clinical trials in Fudan University Shanghai Cancer Center (FUSCC) from 31 January 2018 through 31 March 2019. Thirty-one clinical trials were enrolled, 183 SAEs collected, among which 72 SAEs were drug related. The PD-1 and PD-L1 inhibitors included camrelizumab, toripalimab, HX008, BGB-A317, SHR1316, nivolumab, pembrolizumab and atezolizumab.

Results/key findings: All-grade ADEs were immune-related pneumonia (18.1%), neutrocytopenia (11.1%), fatigue (6.9%) and gastrointestinal bleeding (6.9%). Grade 3 or higher SAEs were neutrocytopenia (11.1%), fatigue (5.6%) and immune-related pneumonia (5.6%). Fatal SAEs were myocardial injury (1.4%) and hepatic dysfunction (1.4%). Local PD-1 inhibitors were associated with lower incidences of diarrhea and immune-related pneumonia (16.7% vs. 0%; 12.9% vs. 16.7%) and higher incidence of neutrocytopenia (16.1% vs. 11.1%) compared with nivolumab and pembrolizumab. Local PD-L1 inhibitor were associated with lower incidence of urinary tract infection (0% vs. 23.1%) but higher incidences of immune-related pneumonia and fatigue (30.0% vs. 23.1%; 30.0% vs. 0%) compared with atezolizumab. No significant differences were found.

Conclusion/recommendations: The results showed different SAEs incidences of PD-1/PD-L1 inhibitors; however, follow-up visits should be done. The results can provide references for pharmaceutical care of immune system.

060

Traditional Chinese medicine use in oncology settings: A questionnaire survey

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Objective/purpose: Traditional Chinese medicine (TCM), which evolved over thousands of years with its own unique theory systems in Asian countries, has been used increasingly as adjunctive therapy in cancer treatment. To investigate the purpose, the benefit and the disadvantage of TCM in oncology settings, we conducted this questionnaire survey.

Study design/methods: The questionnaire consists of 11 questions, mainly involving the basic information of participants, their attitudes and practical experience on TCM. Participants were asked whether they would prescribe TCM for cancer patients, the purpose of TCM in oncology settings, the proper time to start TCM and what kind of TCM should be avoid concurrently with chemotherapy. Online questionnaires were sent through WeChat groups to Chinese medicine practitioners around China, targeted specifically in oncology practice.

Results/key findings: Seventy-five clinicians participated in this survey: 27 from integrated Chinese and western medicine, 14 from internal medicine, 7 from surgery department, 7 from TCM department, 6 from the oncology department, 6 from the pharmacy and 8 from other departments. Among the participants, 81.3% had prescribed TCM. The purpose of TCM varies a lot. About 70% (66.7%) of the participants agreed with the statement that TCM could activate immunity, 61.3% of the participants agreed that TCM could increase the efficacy of cancer treatment, 60% of the participants agreed that TCM could reduce adverse reactions of cancer treatment, 49.3% of the participants agreed that TCM could give patients psychological comfort. As for the proper time to start TCM therapy, 56% of the clinicians chosen the option that TCM could be used together with chemotherapy or radiation therapy. Nevertheless, 89.7% of them admitted that some types of TCM should be avoid concurrently with chemotherapy, the most frequently mentioned were Danshen, Radix Polygoni Multiflora, Sanchi, Cantharidin, Rhubarb and Psoralen. The reasons to avoid these TCM included: liver and kidney dysfunction caused by TCM, loss of appetite, aggravated adverse reactions of chemotherapy, and potential drug–drug interactions with chemotherapy drugs.

Conclusion/recommendations: Taken together, 81.33% of the Chinese medicine practitioners had prescribed TCM for cancer patients. The pros and cons of TCM were both recognized by Chinese medicine practitioners. Most of the participants agreed that some types of TCM such as Danshen, Radix Polygoni Multiflora, Sanchi, Cantharidin, Rhubarb and Psoralen probably should be avoided concurrently with chemotherapy. However, there are different views held that all types of TCM can be used concurrently with chemotherapy as long as they were used in accordance with the symptoms of the individual.

061

Efficacy and safety of lapatinib in Chinese breast cancer patients: A real-world study

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Objective/purpose: Lapatinib is approved for the treatment of metastatic Her2 overexpressed breast cancer with capecitabine after progress on anthracycline, taxane and trastuzumab in China. A post-marketing

pharmacovigilance study was carried out to verify real-world safety as well as efficacy information of lapatinib.

Study design/methods: This is a prospective, pharmacist-led, non-interventional, long-term study in the real-world setting. Between July 2014 and May 2019, a total of 112 patients (median age 52 y/o) were included from Fudan University Shanghai Cancer Center (FUSCC). Main outcome measures are progression-free survival (PFS) and incidences of adverse events.

Results/key findings: Among the 112 enrolled patients, 72 patients (64.3%) were post-menopause, most of the patients were in late phase of disease (90/80% in stage IV, 3 and 19 in stages II and III), and the most common metastatic site was lung (49/44%), bone (34/30%), liver (30/27%), and brain (21/19%). About half of the patients (46.4%) experienced three or more systemic regimens before lapatinib. After a median follow-up of 34.3 months (range 17.9–57.9), median PFS was 8.1 months (95% CI 5.8 to 10.4) in total population. Later phase of disease (stage IV), three or more prior treatments, pulmonary metastasis, liver metastasis, prior anthracycline or taxane, and poor adherence strongly correlated with worse survival ($p < 0.005$). The most common adverse events (grade 3 and above) were diarrhea (9.8%), hand foot syndrome (5.4%) and rash (4.5%).

Conclusion/recommendations: The serious adverse events collected in the current study are similar according to clinical trials. However, patients with pulmonary metastasis or liver metastasis would result in worse survival.

062

The influence of body mass index on the survival outcome for Chinese diffuse-large B-cell lymphoma patients treated with RCHOP

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Objective/purpose: To compare the therapeutic response and safety of RCHOP (rituximab, cyclophosphamide, doxorubicin, vincristine, and prednisone) regimen for Chinese diffuse large B-cell lymphoma (DLBCL) patients with different body mass index (BMI).

Study design/methods: From November 2013 to February 2017, 80 Chinese patients with DLBCL were treated with RCHOP regimen. BSA was capped at 2 m^2 otherwise actual BSA was used to calculate dosages. BSA was recalculated if the change of body weight was greater than 5%. Patients were classified as low or normal weight group (NW, BMI <24) and overweight or obese group (OW, BMI ≥ 24). The therapeutic response and safety were analyzed retrospectively.

Results/key findings: Forty-seven patients were allocated to NW group, while 33 patients to the OW group. No difference ($p > 0.05$) in the characteristics between these two groups was observed. The overall response rate of OW group was significantly lower than that of NW group (90.91% vs. 100.00%, $p < 0.05$); however, the complete response rate showed no significant difference (66.67% vs. 74.47%, $p > 0.05$). The incidence of hematologic serious adverse reactions (grade 3–4) showed a downward trend in OW group (78.72% vs. 63.64%, $p > 0.05$).

Conclusion/recommendations: The current study suggested that high BMI showed a negative effect on the efficacy of RCHOP regimen in the treatment of Chinese DLBCL patients. Some factors may account for this phenomenon: (1) Higher clearance rate in patients with greater weight might lead to less benefit from the addition of rituximab to chemotherapy compared to normal weight patients. (2) Dose reductions, as well as dose capped at 2 m^2 BSA might result in worse clinical benefits. Full uncapped doses of RCHOP regimen administered to obese patients may be more appropriate. Above all, therapeutic regimens or doses for overweight or obese patients with DLBCL are worth re-evaluating.

063

Variation of chemotherapy dosage in prescription practice

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Objective/purpose: More than 600 patients per day receive chemotherapy in Fudan University Shanghai Cancer Center, one of the biggest academic cancer centers in China. On average, a total of 1000+ chemo infusions are prepared by pharmacy clean

room. The current study was carried out to analyze physicians' prescription behaviors, so as to employ pharmacy technologies, such as dose-banding, to facilitate clean room aseptic compounding services.

Study design/methods: About 400 prescriptions from 400 cases, covering NSCLC, breast cancer, colon cancer, and DLBCL, were randomly selected from hospital information system. Dosage variation was calculated between the standard dosage based on BSA and the prescribed dosage of first cycle. Cases were excluded if dosage was reduced due to liver/heart/renal dysfunction.

Results/key findings: Among all the doses included in the final analysis, 19.3% of the doses were found exceeding 5% variance compared to standard dosages. These cases counted for 47% improper doses of cisplatin, 30% for pemetrexed, 8% for cyclophosphamide, and 10% for rituximab. Fifty-two percent of the doses (129 out of 248 doses) were reduced if BSA was more than 1.80 m^2. In patients with BSA less than 1.80 m^2, 31.7% dose adjustment (190 doses of 600 doses) was observed. However, no dose reduction was found in R-CHOP regimen.

Conclusion/recommendations: 37.62% of the dosages were changed by doctors/physicians in order to keep prescriptions in natural numbers or due to greater BSA numbers. These changes might result in more than 13% reduction of standard dosages, which would probably lead to worse response or even worse survival.[1,2] It is necessary to set dose adjustment protocols with clinical therapeutic teams to make standard rounding protocols. Or dose banding could be undertaken to make dose prescribed properly, and chemotherapy standardized product could be prepared.

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Process Improvement/ Pharmacoeconomics (PR)

064

Implementation of a purpose-built chemotherapy prescribing system into a day case treatment unit: An audit

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Objective/purpose: It has been suggested by NHS England that all systemic anti-cancer therapy (SACT), both adult and paediatric (including monoclonal antibodies/targeted therapies, intravenous, subcutaneous, intrathecal and oral chemotherapy) should be prescribed electronically. This proposed model was set out by NHS England's 'Standard Contract for Cancer: Chemotherapy' in 2014. This advice is further reinforced by the 'Improving Outcomes Guidance' developed by NICE, which refers to delivery of 'best practice treatments and support for patients through multi-disciplinary team working'. Moreover, this practice was placed within the Commissioning for Quality and Innovation (CQUIN) scheme in 2018/2019, resulting in major financial losses for individual NHS Trusts that failed to comply.

This investigation therefore aims to explore the benefits of electronically prescribed SACT for the pharmacy team by comparing the number of pharmacist interventions required pre and post-deployment of iQemo (the chosen specialist chemotherapy electronic prescribing system) and analysing how this benefited pharmacist time and workflow.

Study design/methods: The study cohort included two groups of 25 patients that received (SACT) on the Laurel Suite Day Case Treatment Unit as Stockport NHS Foundation Trust. One group was identified before the implementation of iQemo, and the other group was identified after implementation, and pharmacy interventions were compared.

Data collection was performed retrospectively over two separate four-day periods until 25 patients on SACT were identified. Patients included in the study must have received intravenous, subcutaneous or oral SACT prescribed by a consultant haematologist. Patient notes and electronic drug charts were examined daily, and relevant data were collected. Data were compared against pre- and

post-implementation of iQemo and the number of pharmacist interventions analysed.

Results/key findings: Pre iQemo pharmacy interventions:

- 60% of prescriptions done in advance had to be re-prescribed on the day of treatment by a pharmacist to allow SACT administration
- 100% of intravenous and subcutaneous chemotherapy required manual dose banding by a pharmacist
- 60% of prescriptions required some other pharmacist intervention

Post iQemo pharmacy interventions:

- 0% of prescriptions done in advance had to be re-prescribed by a pharmacist
- 0% of intravenous and subcutaneous chemotherapy required manual dose banding by a pharmacist
- 52% of prescriptions required some other pharmacist intervention

Conclusion/recommendations: In conclusion, the implementation of a purpose-built chemotherapy prescribing system into the Laurel Suite resulted in huge benefits for pharmacist time. iQemo clearly reduced the need for manual dose banding and re-prescribing of intravenous and subcutaneous SACT, freeing up pharmacist time for the clinical management of patients. Furthermore, with reduced time spent on prescribing interventions, this enabled improved work flow within the team and improved patient and staff safety in a high-risk area of prescribing.

Additional workflow benefits included: ease of electronic system access between the multi-disciplinary team and aseptics unit, and the ability of iQemo to run reports and for both the SACT database and cancer drugs fund medication allowing reduced risk of financial errors, and again reducing pharmacist time by taking on tasks which were previously completed manually.

065

Full blood count review prior to bortezomib dosing at Guy's Hospital

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Objective/purpose: Bortezomib-based regimens are frequently used to treat multiple myeloma. A full blood count (FBC) is tested at the beginning of each cycle of bortezomib-cyclophosphamide-dexamethasone (VCD), bortezomib-melphalan-prednisolone (VMP) and bortezomib-thalidomide-dexamethasone (VTD) as per local protocols. If platelets are $\geq 75 \times 10^9$/L for VCD and VTD, or $\geq 70 \times 10^9$/L for VMP, and grade 2 or less neutropenia, bortezomib is given on day 1. Platelets must be $\geq 30 \times 10^9$/L and neutrophils $\geq 0.5 \times 10^9$/L for mid-cycle bortezomib to be administered. In this retrospective review, we aim to determine if mid-cycle FBC tests continue to be necessary.

Study design/methods: Patients commenced on VCD, VMP and VTD between 1 January 2014 and 31 December 2017 were identified from the e-prescribing system. Patients who received at least one cycle of treatment were included. Patient demographics, prior lines of treatment, treatment cycles received, baseline FBC and FBC results whilst on treatment were collected. Bortezomib dose delays/reductions due to cytopenias were noted. Possible reasons for mid-cycle neutropenias/thrombocytopenias (as defined above) were explored by accessing patients' medical notes and e-prescribing system.

Results/key findings: A total of 120 patients, who had 1793 FBC tests, were identified. No episodes of mid-cycle grade 4 neutropenia or episodes of platelets $<30 \times 10^9$/L were observed for patients on weekly VCD, weekly and twice-weekly VTD. No mid-cycle grade 4 neutropenia was observed on twice-weekly VCD. Mid-cycle grade 4 thrombocytopenia was observed for one patient (1/14, 7.1%) on twice-weekly VCD; the patient had marrow involvement, baseline platelets of 34×10^9/L and three prior lines of treatment. Mid-cycle thrombocytopenia/neutropenia as defined in local protocols were observed for three VMP patients (3/36, 8.3%). In total, 4/678 (0.59%) mid-cycle FBC tests for VMP patients indicated thrombocytopenia/neutropenia; three of those tests were during cycle 1. Two episodes of mid-cycle thrombocytopenia and one episode of neutropenia were experienced by one patient. Neutropenia and thrombocytopenia were observed on a single FBC test for that patient. One patient, who commenced VMP as an inpatient and had episodes of febrile neutropenia between bortezomib doses during cycle 1, had cycle 2 day 15 bortezomib dose omitted due to neutropenia.

Conclusion/recommendations: The results suggest that bortezomib administration, as part of VCD

and VTD regimens, without reviewing mid-cycle FBC, would not result in harm to any patients. One VMP patient had multiple pre-existing comorbidities, which may have contributed to poor tolerance of chemotherapy. Two of the VMP patients who experienced mid-cycle thrombocytopenia/neutropenia during their first cycle of treatment had normal FBC baseline and were chemotherapy naïve. Their thrombocytopenia/neutropenia could be a result of the myelosuppressive effect of bortezomib or melphalan. Hence, it is recommended that FBC is tested only prior to day 1 for patients with normal baseline counts for VCD and VTD regimens. For VMP, FBC should be checked prior to each bortezomib dose for the first treatment cycle, then only prior to day 1 unless known thrombocytopenia/neutropenia. Frequency of FBC investigations for patients with marrow involvement/multiple co-morbidities should be decided on a case-by-case basis. The next steps would be to implement this and re-audit in six months.

Funding: Trust.

066

Decentralizing pharmacy sterile preparation operation and dose preparation to reduce patient waiting time at an infusion center

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Objective/purpose: Most of cancer treatment is provided in the ambulatory setting. The increasing number of patients treated in our infusion center has led to a prolonged waiting time for patients and increased work pressure on staff. Prolonged waiting time for chemotherapy will negatively affect patient experience, increase work pressure on staff and result in inefficient use of resources. A process improvement project was initiated at our institution to decrease the waiting time for sterile preparations administered in the infusion center including chemotherapy and biological agents. Our aim is to improve patient experience by improving pharmacy-nurses communication and achieve a sustainable reduction in the waiting time.

Study design/methods: A multidisciplinary team from pharmacy, IT and nursing caregivers worked collaboratively to identify the root causes and contributing factors of prolonged waiting time for patients in our infusion center. A DMAIC (Define, Measure, Analyze, Improve and Control) approach was implemented to evaluate the current situation, provide solutions and implement changes.

After reviewing our current workflow, a three-part plan to reduce waiting time was developed:

- Improve process efficiency through starting an on-site satellite infusion pharmacy equipped with the required biological safety cabinets and trained pharmacy staff.
- Enhancing pharmacy-nursing communication through a daily morning huddle, updated sheet of planned treatment and creating email group to address-related issues.
- Using information technology applications that include:

  (1) Utilize automated dispensing cabinets to load essential medications like pre-medication and create virtual kits for anaphylaxis and extravasation management that will lead to immediate access of emergency medications.
  (2) Use a medication tracking system to monitor medications waiting time.
  (3) Develop a daily advance preparation report from our health information system to alert the pharmacist about the expected preparation needed ahead of time.

To evaluate the impact of the proposed plan, we used the current average waiting time as a baseline (control) to compare the new waiting time after implementing the new service (intervention). Nursing satisfaction survey was also used to evaluate the feedback of the infusion center nurses on the new service.

Results/key findings: A significant reduction in the average waiting time was observed after implementing our intervention. Overall, there was a 50% reduction in average waiting time compared to baseline (control). The reported average waiting time from ordering till checking the prepared medications was around 45 min compared to 90 min before implementing the new process. Additionally, the average time between checking and delivery of the prepared medications has improved significantly from 30 min pre-implementation to only 2–5 min post-implementation. The results of the nursing survey showed a signification satisfaction with the new service and improved patient experience.

Conclusion/recommendations: Implementation of a satellite sterile preparation pharmacy in the infusion center resulted in a significant reduction of waiting time and improvement in communication between pharmacy and nursing caregivers. Patient experience was also improved with positive feedback from patients about the new service. Our plan is to sustain this improvement by continually monitoring waiting times and addressing any emerging issues.

067

Carboplatin dose deviation between prescribed doses and doses calculated following gynecologic oncology group (GOG) normalized criteria

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Objective/purpose: The aim of this study is to compare carboplatin prescribed doses with doses calculated using the Gynecologic Oncology Group (GOG) criteria to estimate creatinine (Cr) clearance (CrCl) in non-small cell lung cancer patients (NSCLC). GOG established these criteria to reduce bias and standardize across clinical trials: weight descriptors, Cr values and the CrCl formula in Calvert calculations. These criteria were adopted as standard for carboplatin dosing for all oncology patients in our institution.

Study design/methods: Observational retrospective study of carboplatin doses prescribed for patients with NSCLC in doublets regimens during 2018 in a tertiary general university hospital. The GOG criteria recommend to use Cockroft-Gault (CG) formula modified (normalized by body surface area (BSA)); real weight (RW) if body mass index (BMI) $<25\,kg/m^2$ or adjusted weight (AW) if BMI $\geq 25\,kg/m^2$ (AW= (ideal weight (IW) + $(0.4 \times (RW\text{-}IW))$]; Cr (using 0.7 mg/dL as minimum value); CrClr capped at 125 mL/min. The recommended CG formula was included, and an assisted tool was developed in the information system (Pharmis-Oncopharm^{TM}) that manages the antineoplastic drug use process: minimum Cr and maximum CrCl values are automatically applied and an alert reminds to use AW when BMI $\geq 25\,kg/m^2$; AW has to be manually selected in the information system. Variables recorded: gender, age, RW, AW, height, BMI, BSA (Dubois), prescribed dose (first cycle and successive), dosing criteria applied in Calvert formula: AUC objective, Cr, weight descriptor and CrCl. Deviations from carboplatin prescribed doses and doses calculated using GOG criteria (GOG doses) for cycle 1 were calculated; deviation <10% were considered as non-significant. Categorical variables were presented as frequencies (%) and quantitative variables with mean and %95 confidence interval (%95 CI).

Results/key findings: Forty patients and 169 doses were analysed (29 men, 72.5%), mean age: 64.9 (95%CI: 61.8–68.1) years, mean RW: 73.8 (95%CI: 69.0–78.1) kg; mean height: 165.3 (95%CI: 162.7–167.9) cm, mean BMI: 27.0 (95%CI: 25.4–28.5; 23 patients BMI ≥ 25); BS: 1.8 (95%CI: 1.7–1.9) m^2; mean Cr: 1.2 (95% CI: 1.0–1.5) mg/dL. Mean carboplatin prescribed dose (cycle 1): 524.6 (95%CI: 477.9–571.2) mg. Seven patients had Cr < 0.7 mg/dL and only three patients need adjustment to maximum CrCl of 125 mL/min. Mean GOG dose (cycle 1): 532.3 (95%CI: 474.5–590.2) mg.

In 28 patients (70%), dose prescribed in cycle 1 were according with GOG doses. Three of 28 (11%) need dose reductions in successive cycles. In seven (17.5%) patients, doses prescribed were initially reduced (inferior to GOG doses) due to different patients' characteristic. Five (12.5%) patients received doses superior to GOG doses (>10%), 3/5 (60%) with dose deviations ≥20% need dose reductions in cycles ≥2, in 1 patient RW was used instead of AW.

Conclusion/recommendations: Seventy percent of patient doses were in accordance with doses using GOG criteria, 17.5% of patients had doses initially reduced. 12.5% of patients received prescribed doses superior GOG doses. All patients with dose deviation >20% GOG dose in cycle 1 need reduction in successive cycles. Further analysis to identify areas of improvement the assisted tool is planned.

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Impact assessment of a novel chemotherapy medicines assistant role

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Objective/purpose: Chemotherapy Medicines Assistant (CMA) posts were created in conjunction with Macmillan Cancer Support in 2018. These novel posts were funded to bridge the gap between

pharmacy and nursing staff delivering oncology care to meet growing service needs, with the aims of:

- Improving patient experience throughout treatment
- Releasing nursing capacity; improving skill mix utilisation
- Reducing waste of high-cost chemotherapy drugs
- Improving the timely prescribing of chemotherapy and supportive medications, reducing delays and improving pressures on the pharmacy production unit

In order to assess the impact and success of the role, both quantitative and qualitative data collection were undertaken.

Study design/methods: Audit data were collected over one week in December. CMAs were asked to record each task they undertook during the audit timeframe, and identify whether the time invested in the task released capacity from an alternative staff group. In addition, the number of chemotherapy treatments they appropriately prevented being prepared in advance or returned to the production unit due to patient deferral were recorded, in order to quantify reduction in wastage. Costs were assigned using the Ascribe© system.

To complement the quantitative data, qualitative narrative was sought from staff members who work with the CMAs in order to gain opinion on the impact of their role on the service.

Results/key findings: Snapshot audit across one week showed significant input into patient care, allowing re-direction of nursing time to more suitable tasks. This included 15 h highlighting out of range blood results to nursing staff, enabling treatment to be deferred in a timely manner; over 23 h directed to rescheduling appointments; 5 h ensuring scripts were signed in advance and 2 h advising on medication queries and assisting nurses in second checking of supportive medications.

A total of £35,942 was saved via return of unused medication and prevention of chemotherapy treatment being made in advance where patients are too unwell to receive it. This represents a focussed effort to rationalise stock on each ODU and return medication which could be reutilised. On an on-going basis, the CMAs continue to undertake this task which produces smaller savings overall but results in a more effective use of resources.

Comments received from Consultant and nursing staff working with the CMAs indicated ''the effect on reducing delays in treatment, scheduling and associated issues is very noticeable;'' ''the system feels smooth, coordinated and managed''; ''[the CMAs] perform an essential function in communicating with the consultants in a proactive way about toxicities and issues for patients.''

Conclusion/recommendations: Successful implementation of the CMA service reduced delays in the system, improved skill mix and prevented waste occurring. Nursing staff were supported, and many hours of capacity were released over the week of the audit, allowing redirection of time to patient care. This role both directly and indirectly produces effects which improve patient experience.

The limitations of the audit include that it was a small snapshot audit over one week, containing self-reported data which may be subject to incomplete recording. Future planned work includes widening the audit and collecting data over a longer timeframe, including patient experience data.

069
Reducing intensity conditioning (RIC) protocol harmonisation in the UK

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Objective/purpose: Standardisation of reduced intensity conditioning (RIC) allograft protocols is not well established in the UK. Diversity in protocols can prevent effective auditing of outcomes and innovation for new treatment regimens. Most differences in protocols are due to historical preference or consultant discretion; with little reference to the decision support in the first instance. There is need for an official document to guide BMT centres on the RIC protocols with a robust reference source to prevent future ambiguity.

Between June 2015 and December 2016, Matthew Collin contacted the haematology consultants at 24 UK BMT centres to ascertain the extent of protocol diversity in the UK. The results of this survey were then presented to Anthony Nolan and BSBMT,

which consolidated the final RIC protocols for harmonisation to 12.

Anthony Nolan then recruited a pharmacist to look at the 12 protocols and their potential to be implemented on the different prescribing systems.

When researching the final 12 protocols, it was clear that there were still some questions that needed to be answered to ensure that each BMT centre worked off the same protocol.

A survey was distributed to the UK BMT centres to understand the consensus on the following topics:

- Seizure prophylaxis
- Pre-medication of T-cell depleting medications
- Dosing in obesity
- Electronic prescribing systems
- Ambulatory administration of conditioning

Study design/methods: A questionnaire was developed by looking at current UHB BMT protocols and the key points that cause diversity in other centres. The questionnaire was developed with the help of Nick Duncan. An electronic link was sent to the lead haematology pharmacists at 24 BMT centres in the UK. It consisted of 10 multiple choice questions with space to add extra information where required.

Results/key findings: 92% (22 out of the 24) centres replied.

Phenytoin and clonazepam are still first choice for anti-epileptics for busulfan-containing regimes. However, this is generally due to historical references. More centres are moving towards switching to levetiracetam due to better tolerability and few interactions with medications.

There is more variability for alemtuzumab pre-medication than there is ATG. Pre-medication for alemtuzumab does not vary with higher doses of alemtuzumab.

There is no consensus of the use of IBW when dosing obese patients with cyclophosphamide and ATG. There is no clear indication as to when IBW dose is required and the use is sporadic amongst the centres.

Chemocare dominates UK BMT for electronic prescribing. Each centre has their inhouse programming team and does not require extra support for transcription of the regimens.

Only five centres are administering ambulatory conditioning of fludarabine, melphalan and alemtuzumab conditioning, despite this being a key indicator for the five-year forward view.

Conclusion/recommendations: Promotion is key in helping implementation of the project. Most centres are on board for harmonisation and the development of an official document for advice will help.

Future work: To find out the consensus on alemtuzumab administration rates at other BMT centres.

To audit implementation of the protocols at each centre and present the findings at the annual Anthony Nolan retreat.

Funding: Anthony Nolan secondment.

070

Advanced cancer pharmacy technician training and competency framework to validate simple repeat systemic anti-cancer treatment (SACT) prescriptions

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Objective/purpose: A cancer pharmacy team reconfiguration in May 2018 to meet the service requirement for the oncology and haematology directorate, due to recruitment issues, increase in service requirements, increase in new systemic anticancer treatments (SACT) and expanded services led to the development of two Advanced Cancer Pharmacy technicians. The posts are also operationally responsible for the management of the technical cancer services over two sites at Oxford University Hospitals NHS Foundation Trust (OUHFT). One of the roles of these new posts is to validate repeat prescriptions of simple SACT.

The development of these roles required an accreditation and training, Standard Operating Procedure (SOP), to ensure competence and compliance with standards for validating SACT. The SOP was created using existing accreditation models for both pharmacist SACT validation, pharmacy technician Accredited Technician Checking (ACT), and Medicine Management Technician (MMT) accreditations.

The aim of the advanced cancer pharmacy technician training SOP is to provide the following.

- To provide technicians with the skills and knowledge to validate specific SACT medicines and protocols.
- To provide technicians with the skills and knowledge to educate patients on specific oral SACT in the oral education clinic.
- To develop the technician's professional awareness of pharmacy practice.
- To encourage the further development of effective communication skills.
- To develop a professional interaction between pharmacy technicians, registered pharmacists, patients, colleagues and healthcare professionals.
- To support appropriate skill-mix within the pharmacy department.

Study design/methods: To be able to undertake the accreditation, an entry criterion has been set up to include the following:

- To have had continuous cancer experience for a minimum of two years
- To be ACT and MMT accredited for a minimum of two years
- To be accredited and worked in cancer day treatment unit for a minimum of two years
- To be recommended by line manager
- To be at a minimum at band 5 specialist cancer pharmacy technician level

The Advance Cancer Pharmacy Technician accreditation involves reading SOPs, tutorials, double checks for 10× of each simple SACT prescriptions, reflection and learning from errors.

Results/key findings: Learning outcomes have been set in order to ensure the validation meets required standards and governance procedures. Local, regional and national professional bodies and groups have been contacted to validate the training.

Conclusion/recommendations: The Pharmacy Technician Accreditation Panel agreed that the accreditation document is closely following the current ACT and MMT accreditations for the department, The departmental governance meeting required the SOP to be approved by the Medicines Management Therapeutic Committee, the trust legal team, and the Trust Governance Committee to ensure that this way of working was within the parameters for the trusts' legal indemnity insurances. General Pharmaceutical Council (GPhC) stipulate that any accreditations should meet the council standards for safe and effective care and have no concerns for the extended role as long as it does not breach the standards.

The finalised SOP will be reviewed regularly with service needs and will evolve as the Advance Cancer Pharmacy Technicians progress in their roles.

Funding: OUHFT.

071

An audit to investigate adherence to anti-emetic guidelines for the use of aprepitant for chemotherapy-induced nausea and vomiting (CINV)

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Objective/purpose: CINV is one of the most frequently experienced side effects encountered by chemotherapy patients. Research has shown that adherence to anti-emetic guidelines leads to improved control of CINV. This audit was done to assess the level of adherence to network and international anti-emetic guidelines for the prescribing of aprepitant for CINV.

To determine, between 1 April and 30 September 2018, the following:

Standard 1: If all prescribing of aprepitant for CINV is prescribed in accordance with network-approved guidelines
Standard 2: If all prescribing of aprepitant for CINV is prescribed in accordance with international guidelines
Standard 3: Whether nausea and vomiting status is being documented for patients before being prescribed aprepitant
Standard 4: Whether nausea and vomiting status is documented after aprepitant has been prescribed
Standard 5: Whether prescribing of aprepitant is continued for further cycles

Study design/methods: The patients were determined from Bedford, the pharmacy dispensing program at Oxford University Hospitals NHS Foundation Trust (OUHFT) Pharmacy Department, to identify patients who had been prescribed aprepitant over the six-month period. These data were cross-

matched with the aprepitant-prescribing data reported from Aria (chemotherapy prescribing system) for this period. Inclusion and exclusion criteria were developed.

Results/key findings: One hundred and thirty-one patients were prescribed aprepitant for CINV in the period audited. Of these, 119 were analysed achieving 97% confidence interval.

Standard and achieved compliance (%):

Standard 1–49% overall compliance of all patient's audited (analysed by cycle: 65% of cycle 1 s were compliant, 10% prescriptions cycle 2 onwards)
Standard 2–73% overall (analysed by cycle: 83% of cycle 1 s were compliant, 66% compliance prescriptions cycle 2 onwards)
Standard 3–61% overall (analysed by cycle: 15% of cycle 1 s were compliant, 98% compliance prescriptions cycle 2 onwards)
Standard 4–65% overall (analysed by cycle: 65% of cycle 1 s were compliant, 65% compliance prescriptions cycle 2 onwards)
Standard 5–100% overall

Standard 1 illustrated the need for a review of the current guidelines and to assess when it is acceptable to use aprepitant upfront. It also suggests clarification on when aprepitant should be used additionally post cycle 1, as it is being used more widely than the guidelines recommend.

The adherence shown by Standard 2 to international guidelines was 73%. This is greater than the adherence to network guidelines. This illustrates the wider scope of the international guidelines to include regimens which are highly emetogenic.

Conclusion/recommendations: Updating network guidance for CINV would be a priority so that the guidance is in line with international guidance and hence a more uniformed clear guidance for clinicians. This international guidance highlights the emetogenic profiles of chemotherapy regimens and makes recommendations for the use of aprepitant based on this. Therefore, it would be prudent for network guidelines to follow suit and for the guidance to be updated to reflect this advice. A re-audit of prescribing from September 2018 to March 2019 would be beneficial after guidance is updated. Limitations to the audit include multiple consultants who have variation in documentation styles and multiple systems where information can be documented (Aria and EPR).

Funding: OHFT.

072
Service evaluation of the non-medical prescribing service at a regional cancer centre

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Objective/purpose: Oxford University Hospitals NHS Foundation Trust (OUH) is expanding non-medical prescribing (NMP) services.[1] At the Churchill Cancer Centre, Advanced Nurse Practitioners and Advanced Pharmacists support Breast, Colorectal, Lung, Gynaecology, Urology and Myeloma clinics. The goal is to provide benefits to patients and to wider multidisciplinary teams.

Using service evaluation questionnaires, this work aimed to assess the level of satisfaction with NMP services and also to identify and address patient needs.

Study design/methods: The survey was conducted from January to March 2019. Questionnaires were initially piloted in myeloma clinics.[2] Patients were identified randomly and completed one questionnaire each, anonymously.

Questionnaire questions:

1. During your first face to face consultation with the NMP, did you understand their role in the clinic?
   A. Yes, definitely/B. Yes, to some extent/C. No/D. Not sure, can't remember
2. Did you have enough time to discuss your health or medical problems?
   Options, as 1.
3. If you asked questions, did you get answers that you could understand?
   A. Yes, definitely/B. Yes, to some extent/C. No/D. did not need to/E. did not get the opportunity to/F. Not sure, can't remember
4. Would you have preferred to be seen by other staff (e.g. doctor)?
   Options, as 1.
5. Overall, how would you rate your experience with the NMP?
   A. *Excellent/B. Very good/C. good/D. fair/E. poor*

Patients were asked 'what went well?' and 'what could be improved?'

Results/key findings: Fifty patients completed questionnaires with results as follows.

Question

1. 86% (43/50) scored A. (Yes, definitely)
2. 100% (50/50) scored A. (Yes, definitely)
3. 94% (47/50) scored A. (Yes, definitely), 2% (1/50) scored B. (Yes, to some extent), 4% (2/50) scored F. (can't remember)
4. 90% (45/50) scored C. (No), 8% (4/50) scored B. (Yes, to some extent), 2% (1/50) scored A. (Yes, definitely)
5. 82% (41/50) scored A. (Excellent), 18% (9/50) scored B. (very good)

Thirty-six patients provided feedback in the 'Other comments' section. Thirty-four comments related to helpful advice, ability to answer questions, friendliness, and time to discuss issues. One patient felt the consultation could have been conducted over the phone and one expressed confusion regarding appointment dates.

Conclusion/recommendations: 100% of patients rated the service as either 'excellent' or 'very good'.

The role of the NMP was well understood by patients. All stated that the consultations provided sufficient time to address their health and/or social issues.

Five patients indicated a preference for seeing a doctor. It might have been useful to explore these feelings in more detail to identify ways to improve the NMP service.

Patients who had received distressing news were excluded from the questionnaire.

The overwhelmingly positive feedback from this service evaluation reflects the competence and professionalism of the NMP practitioners.

The questionnaire is an effective tool to assess the value of the NMP service. To improve the service, assessments should be conducted periodically and by specialty to identify disease-specific holistic needs.

Funding: Oxford University Hospitals NHS Foundation Trust.

073

Developing pediatric oncology pharmacy services in Sub-Saharan Africa

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Objective/purpose: Globally, pharmacists represent the third largest group of healthcare providers, followed by nurses and physicians. The ratio of pharmacists to population is lowest in developing countries, with about 7.6 pharmacists per 10,000 persons in high-income countries, yet only 0.6 per 10,000 in low-income countries. As a result, the roles of pharmacists vary and result in task shifting with other healthcare providers. In countries with fewer pharmacists, nurses or physicians may perform pharmacy-related activities including preparation of parenteral medications. In countries with a greater number of pharmacists, there may be greater use of the pharmacist on the clinical care team and oversight of medication therapy management and vaccination programs. An adequately trained pharmacy workforce has been consistently documented as a cost-effective intervention. Moreover, international groups recommend that any effort to improve access to essential medicines and strengthen healthcare must include a plan to address the pharmacy workforce. The purpose of this work is to describe the development of pediatric oncology pharmacy services through an international collaborative treating children with cancer and blood disorders in Sub-Saharan Africa.

Study design/methods: Texas Children's Global HOPE (Hematology/Oncology Pediatric Excellence) is a collaborative program between Texas Children's Hospital and partner institutions in Sub-Saharan Africa. The overarching goal of the program, launched in February 2017, is to improve the care of children with cancer and blood disorders. Core objectives include strengthening the healthcare system through capacity-building, providing formal education and training, and infrastructure investment. This report describes a longitudinal quality improvement project aimed at improving pharmacy services in two Global HOPE programs.

Results/key findings: A baseline assessment of pharmacy services at Global HOPE partner sites was completed in June 2017. A Director of Pharmacy

was hired to design a comprehensive pharmacy program, including plans and budget proposals for pharmacy staffing, clinical and operational pharmacy services, capacity building through distance-based and on-site education, and pharmacy infrastructure. Although local needs vary, consistent themes include inadequate access to essential medications and supplies, lack of pharmacy staff, and infrastructure improvement. In March 2019, local pharmacists were hired for programs in Malawi and Uganda. A baseline training program was shared electronically. On-site, hands-on training was conducted. Training was tailored to the local context with educational themes including inventory management, proper approaches to aseptic technique, use of personal protective equipment, safe handling of hazardous drugs, and basic pharmacology of chemotherapy. Site-specific needs and pharmacist-specific training requests were developed during the on-site visit. Reduction of stock-outs and access to critical drugs and supplies will be assessed in the coming months.

Conclusion/recommendations: Pediatric oncology pharmacists are a key member of the inter-professional team around the world. Training in pediatrics, pediatric oncology, inventory management, aseptic technique, and the safe handling of hazardous drugs are essential to the role of the pediatric oncology pharmacist. Pharmacists with experience in these domains play a role in partnering with pharmacists in developing countries to advocate for their training, development, and practice-based needs.

Funding: This work was funded in part by the Bristol Myers Squibb Foundation and Sky High.

074

Analysis of the systemic anti-cancer therapy (SACT) returns pathway in chemotherapy preparation and dispensing unit (CPDU) to reduce waste and optimise efficiency

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Objective/purpose: At Trust, intravenous (IV) systemic anti-cancer therapy (SACT) doses are either outsourced as ready to administer products or aseptically prepared in chemotherapy preparation and dispensing unit (CPDU) – under Section 10 exemption.

In May 2018, new SACT returns pathway was implemented to reduce waste of unused chemotherapy doses that had been issued following a go-ahead. This pathway introduced ambient and cold chain management and a Pharmacist assessment to whether doses can be returned. This alongside the increase in ready to administer lines supported then overall waste reduction.

This project analysed efficiency of new pathway through:

1. Recording number of doses and average cost savings through re-use of SACT and increasing number of ready to administer lines.
2. Understand reasons for return to optimise pathway and further reduce waste.

Study design/methods: Data were collected between May 2018 and April 2019.

Doses returned to CPDU from Cancer Day Unit were recorded, using an excel data collection tool. The tool recorded:

- date
- patient details
- number, type of returned doses for reuse/destruction
- aseptically prepared doses for destruction
- average costs (from pharmacy data)

As a sub-analysis, detailed data were collected from February 2019 until April 2019 to review reasons for return and associated costs.

Results/key findings: Between May 2018 and April 2019, a total of 315 doses were wasted. Ninety per cent (n = 287) of which were aseptically prepared and 9% (n = 28) were ready to administer lines. Additionally, 43% (n = 136) included high-cost SACT (defined as >£400 per dose). An average of £10k (range £172–£24k) was saved per month, depending on the drugs involved.

By April 2019, the number of ready to administer lines increased, including new high-cost drugs such as pemetrexed and pembrolizumab. Reused SACT doses increased from 22 to 36 doses (1% of total SACT dispensed) in May–November 2018 to 70–93 (2% of total SACT dispensed) in December 2018–April 2019.

Number of IV SACT doses discarded/month remained consistent (0.65% of total SACT

dispensed). However, in terms of cost, there were peaks depending on the drug. Substantial waste was documented for ipilimumab, due to its high cost but pemetrexed, pembrolizumab, and nivolumab were among the most commonly wasted SACT.

In the sub-analysis, 82 patients did not receive their treatment. Reasons included:

- 59% unwell on treatment day
- 17% did not attend
- 7% had appointment rescheduled
- 6% had poor venous access
- 11% other

Conclusion/recommendations: Following a go ahead, the analysis showed <1% of total annual number of SACT dispensed was wasted. However, cost implications can be significant, depending on the drug involved. There is a strong correlation between number of dose banded lines used and efficiency of SACT re-usage.

Based on the sub-analysis, further work is planned to review pathway for unwell patients presenting on the day of treatment.

Due to the highest wastage by cost, ipilimumab will only be made once patients are deemed fit for treatment on the day.

Implement a consistent telephone reminder system for high-cost drugs.

Continue ongoing staff training to raise awareness of high-cost drugs, ensure pathway is embedded into service and maintain robust data collection.

Optimise ready to administer usage for high-cost lines through introduction of nivolumab and pemetrexed.

Funding: NHS Trust.

075

Profiles of hospital contamination by commonly used and less explored antineoplastic drugs

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Objective/purpose: Assessment of hospital contamination by antineoplastic drugs (ADs) provides invaluable data for evaluation of risks and improvements of working conditions for the work of pharmacists and other hospital staff. This study aimed (i) to develop and validate multi-target analytical method for a broad set of ADs and (ii) to compare levels and profiles of commonly used markers of contamination with less explored ADs in different pharmacy and hospital areas.

Study design/methods: Instrumental method using UPLC-MS/MS for simultaneous analysis of 12 ADs has been validated for standardized wipe samples from different surfaces (steel, table desks, floor materials). This included commonly used markers of contamination (cyclophosphamide – CP, 5-fluorouracil – FU) as well as less explored ADs (paclitaxel – PX, ifosfamide – IF, irinotecan – IRI, metotrexate – MET, capecitabine, imatinib, sunitinib, tamoxifen, doxorubicin, everolimus). In addition, total platinum (Pt) was measured by ICP-MS as marker of platinum-based drugs. Over 300 surface samples were collected in 20 different hospitals in the Czech Republic and Slovakia that represented various pharmacy areas, patient administration units, offices and others. Frequencies and levels of contamination by various ADs were compared at different samplings sites.

Results/key findings: Levels of traditional markers of contamination (CP, Pt and FU) as well as frequency of exceedance of the recommended threshold guidance values for these compounds were comparable in working areas of both large hospitals and smaller patient care units. Around 50% of all samples contained both CP and Pt above the limit of detection (LOD). Maximum values were 880,000 and 115,000 (pg/cm^2) for CP and FU, respectively. Newly analyzed ADs were also commonly detected in hospital surface samples but their concentrations were lower. The most frequently detected were PX, IRI, MET and IF. The highest levels of contamination were found at toilets and at the floors of the patient administration wards. Active ingredients of orally administered ADs (sunitinib, imatinib, capecitabin) were also detected but only rarely at the patient toilets.

Conclusion/recommendations: The present study is one of the first larger scale monitoring documenting serious occurrence and contamination levels of hospital areas by a broad spectrum of different ADs. Levels of contamination are generally independent from the size of hospitals and/or number of AD

preparations. Results from the periodic monitoring help hospital managers for improving working procedures and environment, thus assuring occupational safety of hospital staff.

Funding: Supported by Ministry of Health of the Czech Republic, grant No. NV18-09-00188.

076

An evaluation of the use of adjuvant bisphosphonates in post menopausal breast cancer

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Objective/purpose: The purpose of this study was to audit the use of oral and intravenous bisphosphonates in adjuvant breast cancer treatment to determine whether pre-treatment tests are carried out appropriately and whether ongoing monitoring is carried out in accordance with local protocols. In addition, the study looked at the incidence and the reasons why patients choose to switch from oral to intravenous bisphosphonates.

Study design/methods: The Chemocare® electronic prescribing system was used to identify patients who had started on adjuvant breast cancer chemotherapy between 1 January and 30 September 2018. These data were then used in conjunction with the pharmacy dispensing records and the patient's electronic records to identify patients who had started on a bisphosphonate in this setting. Patients treated with palliative intent were excluded. Pathology results were collected from the hospital pathology results system (ICE).

Standards were set to audit against (standard number in brackets):

- First prescription of ibandronic acid be supplied by the hospital consultant (1a)
- Minimum 28 days' supply provided (1b)
- Length of treatment (three years) is specified (2)
- Dental check carried out before treatment initiation (3)
- Baseline tests carried out
- Renal function (4a)
- Serum Calcium (4b)
- U & E's (4c)

All standards were set with a target of 100%.

Where the record showed discontinuation of the oral bisphosphonate, then information was collected on the reported reason for stopping and the alternative bisphosphonate which had been started.

Results/key findings: Of 51 patients identified from Chemocare, only 18 fully met the study criteria and were included in the results. Standard 1a and 1b were met in 28% and 83% of cases, respectively. Standard 2 was met in 94% of cases. Standards 3 to 4c were all met at 100% providing reassurance that all baseline blood test and dental checks are being carried out in accordance with local and national guidance.

Eighteen patients started on oral ibandronic acid; however, five (28%) did not continue treatment. Two patients switched to intravenous zolendronic acid and the remaining three did not switch to any alternative therapy. The main reasons for stopping or switching were administration problems and side effects. Patients found it difficult to adhere to the stringent administration requirements of oral bisphosphonates (before breakfast, standing upright, etc.).

Conclusion/recommendations: The audit has provided reassurance that the baseline checks required to start bisphosphonates in this patient group are routinely performed. This audit will also provide the basis for a discussion with medical colleagues about the use of oral bisphosphonates as the first choice treatment, when 28% of patients did not tolerate these and either switched to IV therapy or stopped bisphosphonate altogether. There may be opportunities for an oncology pharmacist to take over the initiation and management of these patients to improve compliance. Future studies will look at the ongoing annual monitoring of these patients and investigate in more depth the patients' views of oral bisphosphonate versus intravenous therapy.

077

Improving immunotherapy adverse event management

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Objective/purpose: The development and rapid uptake of immunotherapy (IO) agents in the UK

has changed the outlook for cancer patients but has also led to concerns around effective adverse event (AE) management. AE profiles differ from traditional chemotherapy. Immune-related AEs (irAEs) are common for those receiving IO, and these can occur at any point during treatment and also once treatment has ceased, deeming patient information pertinent to safety. Additionally, delays in the management on these irAEs can lead to organ damage and death.

Our aim was to recommend improvements in the I-O AE management pathway co-developed with a number of healthcare professionals (HCPs) treating patients with IO.

Our objectives were to understand the current gaps in the service and use the understanding to develop solutions and recommendations for improvement.

Study design/methods: The pathway to manage AEs when treated with any systemic anti-cancer therapy (SACT) is broadly similar in England. Key stages of the pathway are the ability for a patient to recognise an AE; patients reporting the AE through the correct channel and appropriate management by the appropriately trained health professional. Authors JB and JP developed a semi-structured interview framework using these key stages. Questions were developed to understand gaps in the management pathway. HCPs from three Cancer Alliances were invited to participate through direct contact, ensuring that we purposively sampled nurses, clinicians and pharmacists and invited an equal number of HCPs per Alliance. The interviews were undertaken by telephone and were analysed by thematic analysis and presented at two organised workshops in London and Manchester, where HCPs formulated recommendations.

Results/key findings: In total, 20 HCPs participated in the interview (10 consultants, 4 nurses, 3 pharmacists and 3 other HCPs). Patient information was understood as an area for improvement. Areas that were seen as poor were reporting time; it was felt that patients would wait for clinic appointments. Patient information was unanimously believed to be overwhelming for patients. Areas of concern were the information sharing between HCPs and obtaining appropriate advice from dermatologists, endocrinologists in a timely fashion. This communication was believed to impact greatly on management. There were training needs identified in those triaging patients reporting AEs particularly regarding 24 h helplines.

Thirty-four HCPs attended the two workshops where recommendations were discussed and developed. The two most prominent areas for improvement were the need for better patient information and the need for a national hub where information/training materials could be accessed. It was clear from discussions that there were disparities in services in England and that more information sharing was essential in reducing these gaps.

Conclusion/recommendations: The recommendations made through the work were also supported through the publication of safety standards. Implementation of recommendations poses a challenge without further infrastructure investment. However, our recommendations have been received by various groups including those developing training and patient information. This work was limited in that recommendations were developed without patient involvement. Further research to understand the patient experience is currently in progress.

Funding: This was a NHS Cancer Vanguard joint working project with Bristol Myers Squibb.

078

Improving efficiency, patient safety and reducing wastage through a first in Europe chemotherapy eOrdering interface

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Objective/purpose: A first in Europe eOrdering interface has been developed, which allows the direct transmission of chemotherapy eOrders from our eChemo prescribing system iQemo to our third-party suppliers, Baxter's compounding system Merlin. Interfaces are a key part of NHS Digitals plan to drive efficiencies with NHS IT systems. A pilot phase of this project has been completed at the Christie, aiming to demonstrate efficiency improvements through reducing resource required to process eOrders. Patient safety will be improved due to reduced transcription of prescriptions as eOrders are sent direct into Baxter's Merlin compounding system. A batch number check will improve safety and ensure that the correct product is administered to the correct patient. Safety with chemotherapy administration is an ongoing issue, and safer practice will improve patient outcomes. Wastage should be reduced as Baxter will get order

status updates for all orders and can act on these as appropriate.

Study design/methods: A retrospective analysis of all eOrders sent via the eOrdering pilot will determine the number of successful eOrders and batch number verifications. Wastage data will be collected from the monthly Baxter KPI reports, and staffing input required is determined. Number of incidents can be retrieved from the trust's incident reporting system, Datix.

Results/key findings: A total of 617 eOrders for 220 patients were sent successfully via the eOrdering interface over a period of four months starting in December. Of these, 617 eOrders 100% had successful batch number input ensuring that the correct product was administered to the correct patient.

No administration incidents were reported for eOrder chemotherapy (misadministration rate 0%). This is in comparison to non-eOrders where on average 10 incidents for misadministrations occur annually across 70,000 Baxter items (misadministration rate 0.014%). It is too early to determine statistical significance.

The number of staff required for order processing is currently unchanged as extra reconciliation was required during the pilot phase; however, Baxter have reported reductions in data input (less transcriptions) and improved quality control. Wastage has decreased, 863 items in November (10% of total orders) pre-interface to 252 items in March (3.3% of total orders). It is not yet possible to ascertain whether this is wholly attributable to the interface; however, potential annual savings on fees alone are 50%.

Conclusion/recommendations: The eOrdering interface pilot has been successful with over 600 cycles processed. The interface setup, however, was very complex, time consuming and complicated by the tri-party testing involved to ensure safety and cost effectiveness. There were no incidents with chemotherapy administration for patients treated with eOrders. This is a good indicator of improved safety; however, further safety benefit realisation will be required once the interface is 100% utilized.

The eOrdering interface provides status updates, allowing for live tracking of chemotherapy orders which is useful for Christie staff. There will be a significant reduction in use of paper and the amount of transcription reducing errors. The final aim of direct transmission of eOrders will be to further drive efficiencies at Baxter. This will allow for further wastage reduction through utilisation of the JIT (Just in Time) inventory management methodology.

079

Using routinely collected data to evaluate 30-day mortality post-chemotherapy

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Objective/purpose: Background: Cancer drug treatments are a mix of traditional cytotoxic chemotherapy, immune-modulating agents and targeted agents, grouped by the term systemic anti-cancer therapy (SACT). Adverse events (AEs) are associated with SACT treatments. These AEs can be minor or in some cases life threatening. For this reason, it is imperative that appropriate treatment decisions are made when initiating therapy. Decisions include choice of treatment, supportive therapies and dose reduction. These decisions must also consider patient factors that will impact tolerability.

A quality measure that can enable an understanding of whether SACT is appropriately assigned is the "30 day mortality" data. Data on deaths within 30 days of commencing SACT treatment can indicate areas of concern as highlighted in previous reports. Routinely collected datasets that are submitted nationally can additionally support organisations internally investigate any trends in 30-day mortality.

Aim: To use routinely collected SACT data from one tertiary referral centre in order to find areas of improvement in the safe prescribing of chemotherapy. The following objectives were used:

- To evaluate the total rate of 30-day SACT deaths for the trust
- To evaluate the percentage of deaths attributed to various tumour groups and chemotherapy regimens
- To evaluate deaths by intent of treatment in order to indicate toxicity-related deaths versus disease related.

Study design/methods: A retrospective study was conducted on all patients aged 18 and above, who received chemotherapy at a central London, tertiary

cancer referral centre, and died within 30 days between 1 April 2016 and 30 September 2018. Patient, tumour, treatment characteristics and outcome fields were extracted from the trust uploaded SACT dataset. The 30-day mortality rate was calculated using patient volume at hospital trust level. Descriptive statistics were used to evaluate all other objectives.

Results/key findings: Of 7708 patients receiving chemotherapy, 339 (4.4%) died within the first 30 days of SACT treatment. Of 339 deaths, 62 (18.1%) were due to Non-Hodgkin Lymphoma, followed by Acute Myeloid Leukaemia (44; 12.9%) and cancer of unknown primary cause (39; 11.4%). Notably, nearly half of the deaths (168; 49.6%) happened in palliative chemotherapy. While mortality decreased with cycle number, 196 (57.8%) of deaths occurred at cycle 1.

Conclusion/recommendations: The rate of deaths was comparable to other large tertiary referral cancer centre. The numbers of deaths noted in the haematology setting were reflective of the fact that the trust is regional specialist centre for haematology, meaning complex and often delayed referrals would influence this figure. Nonetheless, the overview of data was able to facilitate in-depth assessment of cases. The limitations of using the data were that cause of death were unavailable, and this granular information is essential in fully understanding deaths. Additionally, due to time limitations, we were not able to extract all data for those that did not die within 30 days. These additional data would enable multivariable analysis in understanding patient risk factors in the future.

080
How and where do patients present with immunotherapy adverse events?

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Objective/purpose: Checkpoint inhibitors (CPIs) have different adverse event (AE) profiles to more traditional cytotoxic chemotherapy. Immune-related AEs (irAEs) associated with these agents can be managed and should be identified promptly to assure optimal outcomes. In order to guide service improvement plans, we wanted to understand at what point AEs are experienced, how and where they were reported and managed.

Study design/methods: Data relating to patients with lung, bladder, prostate and head & neck cancer who received CPI treatment between 1 April 2015 and 31 July 2018 were extracted from the Chemocare e-prescribing database at University College London Hospital (UCLH) and clinical data included for analysis at a single time point (31 July 2018). We included all patients aged 18 or above who had received CPI and excluded those receiving treatment within an early phase trial or a placebo-controlled trial. A case note review of electronic hospital records was conducted by a member of the clinical care team to extract the data using a structured data extraction form. Descriptive statistics were used to summarise findings using SPSS version 24.

Results/key findings: We included 62 patients and found 78 AEs were experienced by 36 patients (58%), with one patient experiencing 10 AEs. In total, there were 65 total episodes of reporting analysed as some patients reported multiple AEs; 30 were classified as mild, 23 moderate and 11 severe. AEs included diarrhoea, skin problems and constitutional effects such as fatigue. Twenty-seven of mild AEs (90%) were self-managed and reported to the doctor at the next clinic appointment. This was also the method of reporting for 65% of moderate AEs (15/23). Only three (13%) moderate AE episodes were reported via the 24 h helpline. Interim self-management in these mild/moderate cases involved seeking community pharmacist advice (10/53, 19%). Most of the severe AEs were reported using the 24 h helpline or patients presented directly to the emergency department (ED). Ten serious AEs required oral steroids as treatment. Eight patients also required delays to treatment but not permanent discontinuation. CPI treatment was discontinued in two-thirds of patients due to disease progression.

Conclusion/recommendations: Our study has shown that most AEs are manageable if reported and treated promptly. We found that reporting of non-serious AEs is often left until routine clinical visits and is an area for development. The reporting of mild to moderate AEs was mainly at scheduled clinical visits preceding the next planned treatment, meaning that patients were not accessing prompt management. It is unknown whether this was due to socio-economic factors, access to services or other reasons. We were concerned that there is a lack of community training and recognition of the AEs associated with CPI. We have learnt that patients do self-manage symptoms

such as mild rash and diarrhoea, which require monitoring. The impact of low-grade AEs and their management is an area that requires exploration and better understanding, as many of our patients were not reporting these until routine clinic visits. We intend to explore patient decision-making in reporting AEs in more detail in semi-structured interviews.

Funding: This study was funded through a research grant through Bristol Myers Squibb.

082
Pharmacy-led initiative to improve SACT data compliance

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Objective/purpose: Background: All NHS chemotherapy providers are required to submit data on systemic anti-cancer therapy (SACT) activity. This is collated by the chemotherapy intelligence unit (CIU) and forms the SACT chemotherapy dataset.

An electronic prescribing system (JAC-CMS) has been implemented at Bedford Hospital NHS Trust since March 2017. However, 12 months later, there were still major issues with SACT data compliance in selected fields, which were not mandatory fields for prescribing.

In March 2018, the Bedford Hospital Pharmacy Aseptics team launched a pharmacy-led initiative to improve SACT data compliance.

Objectives:

- To design and implement a pharmacy-led initiative to improve SACT data compliance
- To assess SACT data compliance in order to monitor progress

Study design/methods: The Pharmacy Aseptics implemented a four-part approach in order to improve data compliance;

1. *Changes to e-prescribing user interface* – mandatory fields were highlighted with **SACT** to ensure that they were easily recognised by prescribers as being mandatory fields
2. *Education of prescribing team* – all prescribers were reminded of the mandatory fields that must be complete for SACT data, and the importance of this for the Trust and the NHS as a whole
3. *Verification by screening pharmacists* – Screening pharmacists in Aseptics double checked mandatory fields and completed where possible or put reminders in the patient's notes on JAC-CMS
4. *Ongoing progress reporting* – Compliance with the problematic fields was retrospectively analysed using SACT data reports and presented to the prescribing teams each month to highlight ongoing progress for each consultant.

Results/key findings: Over the period of nine months, a total of 7388 lines of chemotherapy were administered via JAC-CMS to 778 patients. Each of these lines of chemotherapy was assessed for SACT data compliance, and the change in compliance was monitored throughout the project.

Following the implementation of the initiative, major improvement was seen in SACT data compliance. The most significant of these were performance status (pre-initiative compliance 42% up to post-initiative compliance 98%) and staging (48% up to 94%). Improvements were also seen in decision to treat date (61% up to 94%) and treatment intent (88% up to 97%). There was a marginal improvement in height (95% up to 98%) and weight (96% up to 97%).

Conclusion/recommendations: The results show a major improvement in SACT data compliance over the test period. This indicates that a pharmacy-led initiative can be successful in improving SACT data compliance. However, this data analysis includes only whether the relevant fields were completed and does not take into the account quality of data. During the process of reporting ongoing progress with SACT data compliance, it was discovered that three patients had been staged incorrectly due to a selection error by the prescriber. Although this was immediately obvious, it is possible that there may be other data quality issues that have not been identified.

083
The multi-disciplinary management of vitamin D deficiency in HSCT patients in the post-transplant clinic and the impact on clinical outcomes: An interim report

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Objective/purpose: The immunomodulatory properties of vitamin D are known to play a crucial role in the prevention and treatment of graft versus host disease (GvhD).[2]

There are a variety of reasons for why patients undergoing hematopoietic stem cell transplant (HSCT) may present with low vitamin D levels, from reduced sunlight exposure to poor gastrointestinal absorption of vitamin D and drug treatments like chemotherapy, corticosteroids and later in the transplant process, calcineurin inhibitors. Vitamin D has been variably associated with increased complications, including GvHd, with a potential impact on survival outcomes.

This study has been conducted to determine the impact of the prescribing pharmacist in conjunction with the haematology dietician in identifying HSCT patients with vitamin D deficiency, appropriately treating and the impact on clinical outcome.

Study design/methods: Single-centre study conducted at Cambridge University NHS foundation Trust.

Retrospective data collection to demonstrate prevalence of vitamin D deficiency in this HSCT patient cohort.

Ongoing data collection to demonstrate the prevalence of GvHd when vitamin D deficiency is appropriately managed.

Patient cohort consisted of HSCT patients in the HSCT clinic setting. The aim was to identify 50 patients undergoing/having undergone a transplant and determine their vitamin D status at day 0 and post transplant.

The longer term outcome for the study is to determine if replacing vitamin D impacts post-transplant complications like GvHd.

Results/key findings: Fifty patients were identified in this study. Levels of 25OH were recorded at Day zero (D0) of the transplant.

Seventy per cent of patients were identified as having low levels of vitamin D at D0 (20% deficient, 50% insufficient). Only 22% were treated appropriately. To note, these results were before implementation of Trust guidance of appropriate monitoring and treatment in this patient group. The results of this study are still in the process of being interpreted for the impact regarding GvHd.

Conclusion/recommendations: To date, we are able to conclude that vitamin D levels in the HSCT patient cohort are frequently deficient. We are still processing the results to determine the incidence of GvhD, and the role vitamin D deficiency may have played in this. Once complete results are available, we hope to show that by appropriate use of the multi-disciplinary team we can improve patient outcomes by maintaining sufficient vitamin D levels, and reduce the incidence and/or severity of GvHd.

084

Cost minimisation analysis of intravenous or subcutaneous trastuzumab treatment in patients with HER2-positive breast cancer in Ireland

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Objective/purpose: Two large acute Irish University teaching hospitals changed the manner in which they treated human epidermal growth factor receptor (HER)2-positive breast cancer patients by implementing the administration of trastuzumab via the subcutaneous (SC) route into their clinical practice. The study objective is to compare the trastuzumab SC and trastuzuamb intravenous (IV) treatment pathways in both hospitals and assess which route is more cost-effective and time saving in relation to active healthcare professional (HCP) time.

Study design/methods: A prospective observational study in the form of cost minimisation analysis constituted study design. Active HCP time for trastuzumab SC and IV-related tasks were recorded. Direct costs measured included HCP costs, consumable costs and drug costs. HCP costs were calculated using fully loaded salary costs. Loss of productivity (indirect) costs for patients were calculated using the human capital method.

Results/key findings: On average, the total HCP time saved per trastuzumab SC treatment cycle relative to trastuzumab IV treatment cycle was 59.21 min. Time savings in favour of trastuzumab SC resulted from quicker drug reconstitution, no IV catheter installation/removal and less HCP monitoring. Over a full treatment course of 17 cycles, average HCP time saved accumulates to 16.78 h with an estimated direct cost saving of €1609.99. Loss of productivity for patients receiving trastuzumab IV (2.15 days) was greater than that of trastuzumab SC (0.60 days) for a full treatment course with an estimated indirect cost saving of €176.59.

Conclusion/recommendations: Trastuzumab SC treatment has proven to be a more cost-effective option than trastuzumab IV treatment that generated greater HCP time savings in both study sites. Healthcare policymakers should consider replacing trastuzumab IV with trastuzumab SC treatment in all eligible patients. However, it is predicted that the recent introduction of biosimilar trastuzumab IV in the Irish context may affect this switch.

Funding: This research project was part funded by Irish Research Council (GOIPG/2016/635) and The Leading Edge Group Ltd.

085

Establishment of pharmaceutical consultation service focused on patients in palliative care: Pharmacy of the Dr. Rafael Hernández Regional Hospital, July–September 2018

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Objective/purpose: Formalize the pharmacist's advisory role through the establishment of a pharmaceutical consultation service for palliative care (PCSPC) in the pharmacy service of the Dr. Rafael Hernández Regional Hospital.

Study design/methods: On the basis of the drug law of Panama, formal authorization was requested from the hospital authorities for the creation of PCSPC. Once obtained, a physical space was adapted with desk, computer, internet access, scientific bibliography and file per patient. The monitoring protocols and forms necessary for the execution were designed. The protocols were designed based on patient management in need of palliative care with oncological or non-oncological diagnosis. The protocols include the use of tools such as Eastern Cooperative Oncology Group (ECOG) or Karnofsky, analogous visual scale for pain assessment, advice on the anatomical function of pain management drugs, assessment of medications and dose versus liver function and renal, use and dosage forms, management of side effects of palliative chemotherapy, storage of medication at home and rational use of opioids. The designed forms include, form of reference to the service, informed consent, pharmacotherapeutic evaluation form, patient education material and pharmacist – medical communication sheet. Scheduled visits were made to the palliative care doctors to present the PCSPC and the benefits for the patient, for which corresponding visual aid was designed. Finally, the project was executed and the statistics of the first six weeks of execution were documented.

Results/key findings: The service was offered to three palliative care doctors and, in the first six weeks of execution, five patients with oncological diagnosis and one with a non-oncological diagnosis were referred to PCSPC. The reasons for the referral to the service were: pain medication management, polypharmacy, patients with palliative chemotherapy, and there is no certainty of compliance. Pharmaceutical interventions included: the proper use of the Fentanyl patch, preparation of the pharmacotherapeutic agenda, identification and management of side effects of palliative chemotherapy, monitoring and compliance with therapeutic objectives. All the patients and/or relatives received advice on adequate storage of medicines at home. At the end of the pharmaceutical consultation, the patient was given the pharmacist – medical communication sheet, which documents the interventions carried out so that the doctor can evaluate the results in the next medical appointment.

Conclusion/recommendations: The documentation of the pharmacist's work as an advisor to the patient and the family validates their role in the health team. The key tool is the pharmaceutical-medical communication sheet, since in this, the pharmacist documents the interventions made and the doctor's next appointment, and assesses the results of them. The standardization of PCSPC through protocols and forms for the patient and for this model is to be answered in other pharmacy services.

Funding: Caja de Seguro Social Panama and self-management.

086

Pre-dispensing oral systemic anti-cancer therapy in the breast cancer clinic

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Objective/purpose:

- To remove the need for breast cancer patients to wait in the outpatient pharmacy to collect their oral SACT at Guy's Hospital.
- To allow oncology pharmacists to utilise the oral SACT medication to provide a counselling consultation with the patient.

Study design/methods: Patients receiving oral systemic anti-cancer therapy (SACT) at Guy's Cancer Centre attend clinic every one to two months. They have their bloods taken, receive a toxicity assessment by a clinician and are seen by a hospital clinic pharmacist who counsels them on their medication providing them with a paper printout of their prescription. The patient takes the prescription to the outpatient pharmacy (OPP) to collect their oral SACT. To remove the wait at the OPP, we initiated a pre-dispensing pilot, whereby the patient's oral SACT has been pre-dispensed in advance and is ready waiting for the patient to collect in the clinic from the hospital clinic pharmacist after they have had their bloods and clinical review.

Data were collected for four months (December 2018–March 2019) using an Excel spreadsheet. The pre-dispensed oral SACT items were collected by the clinic pharmacist from the OPP on the day of clinic. The clinic pharmacist recorded the items they had collected on the spreadsheet. As they screened and gave out the oral SACT to the patients throughout the day, they recorded the number of medications given out, the type of medication given out and the reasons why the treatment was not given out. Pre-dispensed items were only given out to the patient once they had a satisfactory blood result and clinician review. All pre-dispensed items were pre-prescribed in advance by the clinician.

Results/key findings: A total of 149 items were pre-dispensed in advance of the patient's clinic appointment. This included the regimens; capecitabine, everolimus, cyclophosphamide and methotrexate, palbociclib and ribociclib. Of those pre-dispensed, 102 (68%) were given out to patients in the clinic, and thus 102 patients did not have to wait in the OPP to collect their oral SACT. The main reasons why patients did not receive their pre-dispensed oral SACT was disease progression (17%), the patient had a toxicity and was delayed or the dose was reduced (34%), there was a process error such as there was no prescription or the patient's appointment had changed (45%) or the patient did not attend (4%).

Conclusion/recommendations: Sixty-eight percent of our breast cancer patients who received oral SACT were able to collect their medication from the clinic pharmacist and thus avoided waiting in the OPP. There will always be some oral SACT that will not be given out due to disease progression, unacceptable bloods, other toxicities or no attendance. Patients who have their doses adjusted or are prescribed additional supportive medicines will still need to visit the OPP to collect these medications.

The oral SACT that was not given out due to process errors needs to be analysed further to determine whether the pre-dispensing service can be improved to minimise this. The pre-dispensing service will next be rolled out to upper gastrointestinal, thyroid and CML.

087

Removal of existing antineoplastic drug contamination from hospital surfaces – Comparison of efficiency of different disinfectants

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Objective/purpose: Various disinfectant products are commonly used during routine cleaning procedures in hospitals to minimize contamination by pathogenic bacteria. However, the efficiency of these disinfectant agents towards antineoplastic drugs (ADs) that are often found as contaminants of work places in oncology pharmacies and hospitals have not been systematically studied. The objective of the present case study was to investigate changes in existing (historical) floor contamination by ADs in a model hospital during repeated cleaning by different disinfectants.

Study design/methods: Data from the 10-year systematic monitoring of AD contamination in the Czech Republic hospitals (pharmacies – storage and preparation vs. other hospital areas – patient treatment units, offices) were used to identify the most contaminated hot spot site(s) in hospitals. Case study was conducted in a model oncology hospital at two different patient administration wards focusing on removal of existing floor contamination. Concentrations of two widely used ADs (5-fluorouracil (FU) and cyclophosphamide (CP)) were monitored before and during repeated cleaning of the floor surface (three consequent treatments of one spot by a specific disinfectant). A standardized wiping procedure followed by UPLC-MS/MS was used to determine ADs. In total, 10 disinfectants based on different active ingredients (chlorine-, peroxide-, detergent-, alcohol-, peracetic acid-, glucoprotamine-, glutaraldehyde-, etc.) were selected from a survey on disinfection practices in the Czech hospitals.

Results/key findings: The focus was on removal of two major and commonly used ADs that were present in relatively higher concentrations on the floor of hospital used in the case study (average concentrations before disinfection – 500 and 300 pg/cm^2 for FU and CP, respectively). Irrespectively of the disinfectant, FU was more efficiently removed in comparison to CP, for which none of the compared agents was able to achieve 100% efficient removal (around 10% of the initial concentration was still found even after repeated treatments). Chlorine-based and detergent-based disinfectants were more efficient (100% efficiency for FU after the first cleaning) in comparison to peroxide-based products using, e.g. hydrogen peroxide and peracetic acid. Problematic appeared to be a disinfectant containing concentrated mixture of alcohols (ethanol, propanol and isopropanol). Its use actually did not lower the initial surface concentrations of ADs but higher concentrations (up to three times increase in the case of CP) were detected during repeated treatments of the floor surface (20- and 10-year-old flooring made from vinyl).

Conclusion/recommendations: This – still ongoing – study provides some of the first data on efficiency of disinfectant agents towards removal of existing (historical) contamination of hospitals by ADs. The results indicate that chlorine-based and detergent-based agents are more efficient for AD removal in comparison to peroxide-based products. Alcohol disinfection products seem to mobilize older AD contamination from the upper floor surface layers, which may eventually increase exposure of hospital staff. Mechanism beyond this observation remains to be clarified.

Funding: Supported by Ministry of Health of the Czech Republic, grant no. NV18-09-00188.

088

Impact of fully automated chemotherapy preparation on safety, performances, and workflow in an Italian multisite cancer center

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Objective/purpose: In 2012, the clinical pharmacy of the Institute for Research and Treatment of Cancer IRST (Meldola, Italy) started his journey in the automation of the oncology production with the aim of managing the increasing workload and of guaranteeing the higher level of safety and quality. Nowadays, the production is fully automatized, with two robotic systems (APOTECAchemo) and one gravimentric workflow supporting device for manual compounding (APOTECAps). Manual and robotic productions run in parallel and are operated by two and one pharmacy technicians, respectively. This study aimed to evaluate the impact on the pharmacy workflow and on the performances of the automated compounding process in terms of productivity and accuracy.

Study design/methods: Data taken from the pharmacy workflow management software were examined over a period of three years (2016–2018). Prescribing dates and times were analyzed, and the average interval time between the medication order (MO) and the medication administration (MA) was determined for both inpatients and outpatients. The annual throughput was calculated for robotic and manual compounding, as well as the percentage of each production. Dose accuracy was calculated by the mean absolute preparation error, i.e. % discrepancy between the compounded and the prescribed dose.

Results/key findings: In total, 104,950 chemotherapy doses were compounded over three years. Overall, 58% of the MO were received between 6 and 24 h

before the MA, 34% less than 6 h before the MA, and 8% more than one day before the MA. Of the overall prepared doses, 66% were prepared with the robot APOTECAchemo and 34% were manually prepared either using gravimetric controls with APOTECAps (21%) or using the classic volumetric technique (13%). From 2016 to 2018, the total annual amount of doses prepared with the robot increased by 33% (from 20,331 doses/year to 27,088 doses/year), whereas the total annual amount of doses manually prepared decreased by 20% (from 11,566 doses/year to 9238 doses/year). Fully automated compounding covered 86% of total production in 2016, while 91% in 2018. Regarding the overall dose accuracy, APOTECAchemo showed better performances with 98.5% of preparations within the ±5% interval, versus 95.9% of the manual compounding with APOTECAps. Overall, less than 0.4% of preparations showed a drug error exceeding ±10%. A total of 78 different active ingredients were processed, including conventional anticancer drugs, monoclonal antibodies, biosimilars, and adjuvant drugs.

Conclusion/recommendations: The results of this study revealed that the pharmacy workflow enables in-advance preparation of ready-to-administer oncology products, thereby providing a best turn-around time and improving the working efficiency of the compounding unit. The increasing utilization of the automated systems guarantees the possibility to measure and control every step of the entire production process, thus ensuring high quality of care for cancer patients.

089

Enhancing clinical pharmacy support for allogeneic stem cell transplant patients

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Objective/purpose: Prior to admission for allogeneic stem cell transplant (SCT), it is important that relevant medicine-related issues that may impact on the inpatient stay are identified and addressed. Concern had been raised in our organisation that clinically important issues were not being identified in a timely fashion. One way of addressing this concern would be to build a formal clinical pharmacy assessment into the pre-transplant work-up programme. Consequently, we decided to pilot a pharmacy-led pre-admission medicines assessment for allograft patients. The aim of the project was to demonstrate the feasibility of the new service and demonstrate enhancement of the pharmaceutical care that we provided to this high-risk patient population.

Study design/methods: The pilot commenced in January 2019. As part of their pre-transplant work-up, patients were booked in to see a pharmacist for a 30-min consultation, usually two to four weeks prior to a planned admission. Using a pre-printed template, the pharmacist discussed (and documented) the following topics with the patient:

- the role of the pharmacist
- Drug history including herbal products and supplements
- Drug allergies
- Adherence
- Swallowing difficulties
- Drug-related issues associated with earlier treatments and strategies for post-transplant management
- Supportive medicines that the patient will receive during their admission

After the pharmacy review had taken place, a PDF copy of the completed consultation template was emailed to all relevant clinical staff and uploaded onto the Trust's electronic patient record system. Specific issues arising from the consultation (e.g. need for dose adjustments for obesity or organ dysfunction, choice of antifungal prophylaxis, relevant drug allergies, etc.) were discussed at the earliest opportunity with the patient's consultant. During the study period, details of number of patients seen and interventions made were recorded on an Excel spreadsheet. After three months, a short survey was undertaken with medical and nursing staff involved in the transplant programme.

Results/key findings: During the first three months of the pilot (January–April 2019), 30 patients (out of 32 admitted for transplant) were reviewed by a specialist haematology pharmacist. Forty-one clinical interventions were made. Examples of interventions included:

- Stopping herbal supplements due to toxicity and/or drug interaction concerns
- Highlighting the need for additional anti-emetic support due to toxicity with previous chemotherapy

- Obtaining an up to date patient weight and advising on chemotherapy dose adjustments for obesity
- Identifying previously unrecorded drug allergies
- Identifying potential drug interactions with ciclosporin

The staff survey results (n = 5) demonstrated high levels of satisfaction with the initiative – all respondents agreed or strongly agreed that the pharmacy review was a positive development and that it had assisted with clinical management of patients. All respondents wanted the service to continue and it was suggested that the service be expanded in scope to include prescribing of conditioning chemotherapy and supportive medicines. Informal feedback from patients at the end of their counselling session was uniformly positive.

Conclusion/recommendations: Building a formal pharmacy assessment into the allograft journey is achievable, has been well received by patients and clinical colleagues and has allowed for the early identification and resolution of clinically important medicine-related issues.

090

Development of a tool to support the use of RX-Info Define® software at The Royal Marsden Hospital (RMH) and other tertiary cancer centres

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Objective/purpose: Developed by RX-Info, Define® is an online software which uses drug issue data, to enable benchmarking of cost, safety and quality of medicines use. This allows comparison of prescribing practices against other trusts in order to identify best practice and potential cost savings. The NHS Model Hospital Programme and the Antimicrobial Resistance initiative have prioritised these elements.

Over 90% of acute NHS hospitals utilise Define® and the reports developed by RX-Info for their specific needs. Specialist centres can customise search criteria for a more meticulous comparison. As cancer treatment is a huge financial burden on the NHS, Define® identifies areas where prescribing is outside recommended guidance. The reasons can then be investigated to explore possible improvements and potential financial savings.

RMH pharmacy aims to harness the full potential of Define® for use in a specialist cancer centre. To do this, specialist pharmacists must be able to understand the functionality of the software and use it routinely. This learning can then be shared with other cancer centres and units across the NHS in England.

Objectives

- Design a user-friendly tool, with standard reports, for pharmacy staff to utilise Define® at a specialist cancer centre
- Provide training and support to users
- Demonstrate the initial uptake of Define® use
- Embed an ongoing culture of pharmacy staff utilising Define®

Study design/methods: An NHS Regional Procurement training day for Define® was attended, and as a result, an initial usability proposal was developed at the Royal Marsden Hospital (RMH). A tool with a list of potential reports was created, and feedback was sought from key users. Internal training sessions were organised for specialist pharmacists showcasing the potential uses and benefits of Define® with arrangements for continual support and development of usability/functionality. This took place over a four-month period (December 2018–March 2019).

Results/key findings: A tool with scope, responsibility and examples was developed. This, combined with training provided, resulted in pharmacists having the competency and confidence in using Define. Examples of reports carried out since the development of the tool:

- Identify commonly prescribed DOACs in cancer
- Compare uptake of trastuzumab biosimilar within RMH's region
- Compare usage of IV diclofenac and IV paracetamol to local, regional and national hospitals
- Compare usage of *Clostridium difficile*-causing medications and *C. difficile* treatment to other cancer centres

Conclusion/recommendations: Several generic reports have been created by the developers of Define® in order to facilitate usability in hospitals. These have been refined and a tool developed in order to highlight ways for usage in the oncology setting. In order to benefit from the features offered, the software should be actively used. The tool developed has provided a structure for using Define® at the Trust and

made pharmacists aware of its benefits with the ability to embed routine usage into practice.

Next steps:

- Maintain momentum of pharmacists at the RMH using Define®
- Undertake regular reviews to assess the tool's usability and share reports with peers
- Share learning with other UK cancer centres with the possibility to create a user forum

091

Cost-minimization analysis for determination of genetic polymorphisms in clinical practice

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Objective/purpose: To compare polymerase chain reaction (PCR)-sequencing method and real time PCR (rtPCR) with HybProbe® fluorescent probes method, using a cost minimization analysis to determine the lower-cost method for the identification of genetic polymorphisms in clinical practice.

Study design/methods: The cost-minimization calculator was designed using Excel®2003. Direct cost derived from the simple nucleotide polymorphism (SNP) determination was compared between the two methods:

Method 1: Amplification by PCR and sequencing

Method 2: rtPCR and HybProbe® with allele-specific fluorescent probes determination.

Registered variables for sensitivity analysis were: SNPs to be determined, monthly samples and sequencing price.

Base case was performed with: 22 monthly patients, with 34 SNPs by patient, during two years and a sequencing cost of 5€ per determination.

The sensitivity analysis was done with: cost sequencing between 2 and 7€; number of patients between 5 and 40 and a number of SNP determinations between 5 and 60.

Results/key findings: The base case would involve a cost of: 101,944.5€ for method 1 (212.4€/patient) and 20,118.6€ for method 2 (41.9€/patient).

The sensitivity analysis showed that a reduction of 60% in the sequencing cost would reduce the method 2 cost to 52,984.5€.

To reduce SNPs to 5: method 1: 18,400.1€; method 2: 4,900.3€

Therefore, for method 1 to be cheaper the following are necessary: cost per sequencing of €2.5, no more than nine patients/month and a maximum of 10 SNPs to determinate (5169.2€ vs. 5.475.1€)

Conclusion/recommendations: Incorporation of pharmacogenetics into clinical practice needs to be a cost-effective activity, so knowing and optimizing the costs of this activity are essential for this implementation. With this work, we want to show a cost calculator to estimate which is the most efficient method for genetic determinations according to the predicted activity.

Funding: FUNCANIS: Fundación Canaria de Investigación Sanitaria.

092

Cost-effectiveness of screening for DPYD polymorphisms

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Objective/purpose: Genetic polymorphisms in dihydropyrimidine dehydrogenase gene (DPYD) have been associated with severe toxicity related to treatment with fluoropyrimidines. The aim of this work was to evaluate the cost-effectiveness of the screening of three mutations in the DPYD gene.

Study design/methods: A five-month study was carried out. Colorectal cancer patients treated with fluoropyrimidines were included. Clinical data of the patients were obtained from SAP® infomatic

application. Toxicities were studied in the first and second chemotherapy cycles.

Analysis was done comparing the cost of screening of DPYDg polymorphisms, and the costs, as hospitalization days, derived from severe toxicity fluoropyrimidine induced in included patients. Only direct cost of reactives and hospital admissions days (434.63€/day, according to 2016 BOC) were included for the analysis.

Genomic DNA was obtained from a peripheral blood sample using the alcaline lysis method. Genetic characterization was carried out using LightClycler®480 platform and specific allele HybProbe fluorescent probes. Polymorphisms analyzed were: rs3918290 (DPYD*2A), rs67376798 (DPYD 2846A>T), rs55886062 (1679T>G, DPYD*13) and 1236G> A/HapB.

Patients were requested to sign an informed consent form prior to the inclusion.

Results/key findings: Fifty-eight patients were included in the study. In one patient, the mutation 2846 A> T (rs67376798) was found and showed a severe toxicity; grade 3 neutropenia, grade 3 mucositis, grade 3 diarrhea, and five hospital admission days (2173.15€). No hospital admissions were described for non-mutated patients.

The estimated cost for DNA extraction was 0.52€ per sample including reagents and plasticware. And the genetics characterization was 7.9€/sample. So the total cost for the all patients genetic characterization was 488.36€.

Conclusion/recommendations: Our data suggest that the DPYD genotyping, using our fluorescent probes HybProbe®, is cost-effective in fluoropyrimidine-based treatments. So, implementation of pharmacogenetics test in clinical practice will not only reduce severe toxicities of these treatments, it will also save costs.

Funding: FUNCANIS: Fundación Canaria de Investigación Sanitaria.

093

Rationalization nivolumab by strategies cost-analysis

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Objective/purpose: Nivolumab, anti-programmed death (PD)-1 agent, has shown good results in terms of efficacy and tolerability in different onco-hematological pathologies; however, the high cost of these agents has led to the needing of the optimization of its use in health-care systems. The aim of this work is to describe the use of nivolumab in a third-level hospital and to analyze changes in cost using different dosing-strategies for nivolumab

Study design/methods: The use of nivolumab was recorded (2017), for all prescribed indications. The total nivolumab-cost (3 mg/kg Q2W) was compared with three different dosing strategies:

Strategy 1: Fixed-dosing of 240 mg Q2W.
Strategy 2: Dose-banding. Single doses were ±10% of calculated body weight for a specific band based on vial size presentations of nivolumab (40–100 mg) to reduce the wastage.
Strategy 3: To group the patients on treatment with nivolumab the same day for minimize the waste of vials.

The relative cost change of each strategy was compared to the total cost of nivolumab during the study period and was calculated as the total difference-cost and as percentages (%). A negative sign for the relative cost represents reduced cost(savings) and a positive sign represents increased.

Results/key findings: During 2017, 18 patients have been treated with nivolumab (eight for lung cancer, five melanoma, three non-Hodgkin lymphoma, one colorectal cancer and one renal cancer). Fifty percent of included patients were men and the median age was 55.7 years. The mean doses administered were 15.1.

The nivolumab cost during this year was 546,807.5€. Cost-changes for the three different strategies were:

Strategy 1: 577.194,4€ total-cost (+30.386,9€; + 5.6%)
Strategy 2: 502.572,3€ (−44.235,2€; −8.1%)
Strategy 3: 531.464,6€ (−15.342,9€; −2.8%).

Conclusion/recommendations: Our results shows that the dose-banding strategies (currently used throughout hospitals in England) can help to further

improve cost-effectiveness of nivolumab, expecting in our scenario a saving of 44,235.2€ (−8.1%) in 2017.

Funding: FUNCANIS: Fundación Canaria de Investigación Sanitaria.

094

An investigation into the source of particulate contamination in IV chemotherapy doses and its cost implication for University College London Hospitals (UCLH)

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Objective/purpose: To identify the source of particulate contamination in IV chemotherapy doses dispensed at the UCLH aseptic unit and evaluate the cost implication of re-dispensing these failed doses.

Study design/methods: An in-house database for all 'rejected' chemotherapy doses (due to visible particulate contamination) was used to gather data between October 2018 and March 2019. These data were used to ascertain the percentage of IV chemotherapy infusions rejected in relation to the type of visible particulate contamination. The cost of rejected chemotherapy doses was calculated using the raw material prices.

Rejected IV chemotherapy infusion bags (n = 19) were analysed using light microscopy (Nikon Microphot PXA – X40 magnification), at the University College London School of Pharmacy. These were selected at random during the six-month period. As a comparative standard, a small slither of plastic 'gondola' membrane located below the rubber additive port of IV infusion bags was also examined.

Results/key findings: Microscopic analysis showed that 17 out of 19 bags contained 'white/clear' particles. All 17 particles were remarkably similar in appearance, showing characteristic striations and distinctively different to 'rubber/vial bung' particles which lacked striations and had greater opacity. The comparator particle was also found to be similarly striated in appearance.

Over the six-month period, 24,290 IV chemotherapy doses were aseptically prepared. 0.74% (n = 179) of these were rejected, at final checking stage, due to visible particulate contamination. 86% (n = 157) of the rejected doses were IV infusions bags, of which 69% (n = 109) had contamination described as 'clear/white' particles, 19% (n = 30) as unknown type, 11% (n = 17) as rubber bung particles and 1% (n = 1) as fibre strands.

The total cost of rejected IV chemotherapy doses was £29,554, of which £7,645 was due to doses containing 'clear/white' particles.

Conclusion/recommendations: A major source of particles, as discovered through microscopic analysis, was the white plastic from the additive port of IV infusion bags. These particles were most likely generated by needles, coring the plastic membrane below the additive port, during the drug additions.

Over the study period, only a small percentage of all chemotherapy doses prepared in the aseptic unit at the UCLH contained visible particle contamination. However, the cost implication of re-dispensing failed doses may well be significant, considering the widespread use of high-cost IV chemotherapy at the UCLH. For this reason, a move for using IV infusion bags with needle-free additive ports is recommended. This would eliminate the risk of generating plastic particles, reduce chemotherapy wastage and the cost associated with re-dispensing failed IV doses.

095

Establishing current practice for calculation of GFR and dosing of carboplatin in the UK and Ireland

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Objective/purpose: Assessment of renal function is crucial in the dose determination of carboplatin. Renal function in terms of glomerular filtration rate (GFR) can be calculated via measured or estimation methods. Measured methods such as Cr51-EDTA are seen as the gold standard, but in practice, formulas are often utilized to estimate GFR for carboplatin dosing. There is much conflicting evidence regarding the best method for estimating GFR for the purpose of carboplatin dosing, especially for specific subpopulations such as the elderly, obese and underweight. In clinical practice, there is thought to be significant variation in methods employed due to a lack of consensus guidance. This research aims to identify variations in clinical practice within the UK and Ireland.

Study design/methods: A 15-question online survey was developed using Survey Monkey. The link to the survey was circulated to BOPA members via email and through a link on a forum of the BOPA website. The survey was open for responses for a period of three weeks from February to March 2019. Responses were then collated to establish current practice in terms of GFR calculation, carboplatin dosing and local recommendations for specific subpopulations.

Results/key findings: A total of 142 responses were collected, of which 136 were analysed covering 101 different cancer centres. Cockcroft and Gault was the most commonly used method for GFR estimation (routinely used in 83% of cancer centres). Measured methods were routinely used in 61% of centres. A quarter of respondents routinely used the Wright formula for GFR estimation, whilst only 3% routinely use the eGFR formula. The CKD-EPI formula was not used by any of the cancer centres surveyed. Local guidance on the dosing of carboplatin in obese patients was available in 28% of centres, but guidance for the dosing in underweight patients was only available in 4% of centres. In cancer centres where guidance was not available, a number of different methods are employed to modify doses to avoid over or underestimation of GFR in these patients.

Conclusion/recommendations: Current practice continues to vary nationally in terms of GFR estimation and carboplatin dose calculation. Despite measured methods being viewed as the gold standard internationally, this is not always achievable in UK practice due to costs and capacity required to routinely carry this out as reflected in the results. This survey demonstrates that Cockcroft and Gault is still commonly used as an estimation formula though some centres are moving towards using the Wright method following some limited evidence demonstrating its superiority over Cockcroft and Gault in the estimation of GFR for carboplatin dosing. Few centres have guidance available on dosing of carboplatin in obese or underweight patients, and in those without guidelines, a variety of different methods are employed to modify doses in these patient populations generally based on prescriber preference. Further work needs to focus on establishing which estimation method provides the most accurate result and determining which methods may be best for subpopulations such as the elderly, obese and underweight.

096

Perceptions and expectations of healthcare providers towards clinical pharmacy services at a tertiary cancer center in Qatar

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Objective/purpose: The clinical pharmacy service (CPS) at the National Center for Cancer Care & Research (NCCCR), a member of Hamad Medical Corporation (HMC), Qatar, was started in 2009. CPS was established to provide comprehensive drug management support and consulting services that help our patients and build a clinically efficient and cost-effective pharmacy program.

Aim: To determine perceptions and expectations of the healthcare providers (HCPs) toward the CPS at the NCCCR.

Study design/methods: A cross-sectional survey was conducted in NCCCR from January to May 2018. A self-administered electronic/paper questionnaire consisting of four domains was sent to HCPs including physicians, staff pharmacists, dieticians and nurses from different units.

The domains of the questionnaire include perceptions, expectations of the HCPs from the CPS, barriers that can hinder clinical pharmacist's role and area of improvements of the CPS at the NCCCR.

The ethical approval was obtained from the HMC Institutional Review Board (IRB) under number: RP 17188/17.

Results/key findings: The response rate was 30% (112/375). The majority of HCPs (74%) perceived an increasing interest in CPS as a profession in Qatar. They expect from clinical pharmacists to (1) provide consultation regarding alternative medication choices (82%); (2) provide information about medication availability and shortages (82%); (3) assist in the prescribing of cost-effective drugs by providing pharmacogenomics information routinely

(75%); (4) participate actively in research projects (74%). Overall, HCPs have a high level of trust in the abilities of clinical pharmacists ($P < 0.01$). However, they are divided on the clarity of clinical pharmacist responsibilities, their knowledge, and level of skills. Nurses were less appreciative ($P < 0.002$) of the positive role of clinical pharmacists in direct patient care compared to both physicians and staff pharmacists (64.2%, 90.0%, and 95.7%, respectively).

Conclusion/recommendations: This study revealed a positive attitude by HCPs towards the CPS in NCCCR. However, there is a need for NCCCR to advance the clinical pharmacist's role by enhancing their availability and accessibility to different units and empowering them to initiate and run pharmacist-led clinics to provide the best patient care.

097

Evaluation of a pilot repeat a prescription request service in a busy haematology outpatient clinic

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Objective/purpose: Haemato-oncology pharmacy services play a vital role in optimising medicines management in this complex patient group. Many supportive medicines provided to these patients are high cost and are often continued for long courses. Patients often wait for repeat prescriptions of medicines often to find that they have existing supplies at home. Implementation of a prescription request service to haematology outpatients would improve patient experience through reduced waiting times and prevent medicine wastage through reduction in over prescribing.

Study design/methods: In a 12-week pilot, patients attending long-term follow-up transplant clinic were contacted the week prior to their appointment, and data were collected on patients attending a Monday clinic only.

Supportive medicines that had been previously supplied on repeat prior to the project but were not requested and therefore not repeated on this visit were documented and evaluated for cost using hospital tariff prices to provide a cost avoidance analysis.

A sample of waiting times for patients (collected during three days of the intervention period) was calculated using the time stamps on the electronic prescribing and tracking systems. For prescriptions requested in advance, the prescribing and screening time were removed from the total waiting time. For prescriptions written on the day, the time from prescribing to screening was added to the time taken for dispensing to collection of medicines.

Results/key findings:

Waiting times were evaluated for 77 patient attendances on three of the days included in the project. Patients that had not been contacted prior to clinic ($n = 66$) had an average waiting time of 1 h 43 min from the point of prescribing to the collection of medicines. Patients that had been contacted and had their prescription prepared in advance ($n = 8$) had an average waiting time of 34 min. One patient was removed from analysis as they had requested medicines in advance through their clinical nurse specialist (these were not prescribed in advance).

Prior to 12 clinic days, a total of 187 patients were successfully contacted; evaluation of the cost of medicines avoided including dispensing costs was £67k.

Conclusion/recommendations: The pilot showed great benefit to patient experience and substantial cost savings by implementing a repeat prescription request service.

Informal feedback from patients was extremely positive of the pro-active pharmacy approach and all comments received were supportive of the service.

Further work is underway to expand the service. Time resource for contacting patients by telephone was identified as a restriction to further roll out of the project. Review of the method has identified that an expanded service will require an electronic platform, i.e. email for receiving patient requests. The next phase will continue to monitor cost avoidances and will require formal feedback of patient experience to be evaluated fully.

098

Optimal selection method of closed system drug transfer device (CSTD) according to facility conditions

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Objective/purpose: In Japan, the medical expenses of each patient are calculated based on reimbursement of medical treatment fees and drug prices determined by the government. The use of CSTD is not currently mandatory. One item of the reimbursement, the sterile preparation handling fee, approves higher score when using CSTD. However, the reimbursement of this score is little and cannot cover the cost of CSTD. Therefore, the use of CSTD does not expand, and many of the facilities use CSTD for limited drugs. At present, six systems of CSTD are available in Japan, but their features are different, and simple comparison is difficult. In addition, since there is no clear selection method, each medical institution often decides to adopt CSTD with its unique values based on the explanation from each manufacturer. As we had a chance to review our hospital's equipment, we examined a selection method and selected the CSTD that is most suitable for the actual condition of our hospital.

Study design/methods: Among the seven CSTD systems of commercial products at the time, the following five systems were reviewed; BD-PhaSeal, ChemoSafe, NEO SHIELD, TEVADAPTOR, and ChemoSafe Lock. We received the product information and samples provided by the manufacturer, and worked sequentially and collected more information while actually using them. We identified each feature, summarized to 10 items in a tabular format, and asked the manufacturer if there was a lack of information. The pharmacists and nurses in our chemotherapy room jointly performed this work, and we graded in three levels; A: good-acceptable, B: somewhat difficult, C: poor-not acceptable.

Results/key findings: Evaluation items were parts variation, exposure risk during preparation, holding of parts attached to the syringe, less coring, ease of preparation, no need for priming by a pharmacist, exposure risk during administration, ease of administration and management of the administration route, applicable to long-term regimens, and follow-up of the manufacturer. Only ChemoSafe Lock system was accepted as the best CSTD for our hospital because there was no C evaluation in the comparison items. We were able to adopt this as it was comparable in cost to other CSTDs.

Conclusion/recommendations: Facilities differ in staffing, percentage of cancer patients, using infusion sets, and stuff values (specifically what they emphasize in comparison items), so the best equipment choices are different. Deciding the appropriate selection method is difficult because the appeal points differ depending on the manufacturer. By clarifying the comparison items and comparing all the information relating them, we were able to select the CSTD that is most suitable for our own facility. There are more comparison items depending on the facility, but this method will be implemented at any facility and will compare each product appropriately.

099

Evaluation of the extent and causes of delay in chemotherapy produced by the South Warwickshire Foundation Trust aseptic unit

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Objective/purpose: The incidence of cancer in the United Kingdom is continuously rising, and as a result, the demand for chemotherapy drugs is growing. NHS pharmacy departments are facing an annual inflation of chemotherapy prescriptions which is threatening their ability to cope and maintain a high-level performance. South Warwickshire Foundation Trust (SWFT) has obtained anecdotal evidence that chemotherapy patients are not receiving their treatment in their scheduled appointment time and often incur delays. This study aims to investigate the extent and causes of delay in relation to chemotherapy produced by the SWFT aseptic unit.

Study design/methods: A baseline clinical audit analysing two weeks of retrospective data was conducted. Timestamp data were recorded for each prescription from patient diagnosis through to chemotherapy administration. The following criteria were outlined by SWFT Cancer Services:

1. All prescription items should be received by the pharmacy 24 h before its assigned delivery slot.
2. Prescriptions received by pharmacy less than 24 h in advance of their slot should have a maximum of a 3-h turnaround time.
3. All clinical queries should be resolved at least 3 h in advance of the allotted delivery slot.

The levels of compliance were categorised into full compliance (<95%), partial compliance (90%–95%) and minimal compliance (<90%). Quantitative background data exploring the number of prescriptions received by the aseptic unit and departmental

workload were also collected to support the audit data. To provide more information about the causes of delay, qualitative semi-structured interviews were carried out with six healthcare professionals employed by SWFT.

Results/key findings: Analysis of audit data showed that SWFT Cancer Services were not compliant with criteria. A total of 85.5% of prescriptions were received 24 h before the delivery slot (*criteria* 1). Of those prescriptions received by pharmacy less than 24 h before the products' delivery, 90.63% achieved a 3-h turnaround (*criteria* 2). A total of 92.74% of clinical queries were resolved 3 h in advance of the products' release for delivery (*criteria* 3).

The number of prescribed aseptic products at SWFT increased by 21.9% between 2017 and 2018. The distribution of prescriptions throughout the week is highly variable; in the data analysis period, 88 prescriptions were received on Friday compared to five prescriptions received on Monday. Both factors are operational threats to the pharmacy department.

The qualitative data indicated no interviewees were able to recall all three criteria, and staff stated that the criteria were developed by pharmacy without the consultation of key stakeholders. Data from the qualitative research also indicated a lack of awareness of pharmacy operations by non-pharmacy staff.

Conclusion/recommendations: The pharmacy department is consistently under pressure to meet the rising demands; the lack of compliance with criteria is likely to increase if the operational departmental threats are not addressed. Effective communication and teamwork are both fundamental to the maintenance of a well-founded workflow in the chemotherapy supply chain, and so the review of SWFT's criteria should involve all key stakeholders. Once finalised, the criteria should be clearly communicated to HCPs.

Funding: This study was funded by Aston University.

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Stability of the trastuzumab biosimilar ABP 980 after intravenous (IV) bag preparation, transport and storage at various temperatures, concentrations and stress conditions

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Objective/purpose: Extended stability data for diluted preparations of trastuzumab biosimilars (IV solutions for infusion) are scarce. We investigated the stability and maintenance of purity and potency of diluted ABP 980 (KANJINTI™, a trastuzumab biosimilar available in the EU since June 2018), compared with reference trastuzumab (Herceptin®) during dosing in IV bags, transportation simulation and extended storage prior to infusion.

Study design/methods: Low-dose (70 mg; 0.3 mg/mL) and high-dose (1200 mg; 3.8 mg/mL) solutions of ABP 980 and reference trastuzumab were prepared in flexible, polyolefin (non-PVC) IV bags (250 mL 0.9% sodium chloride). Dosed IV bags were protected from light and subjected to drop-test, transportation simulation and storage at 2–8°C or 30°C for five weeks, followed by 48 h at 30°C. Stability was assessed pre- and post-transportation simulation at Weeks 1, 2, 4 and 5 and at Week 5 after 48 h at 30°C. Aggregation and particle formation were assessed through visual inspection. Ultraviolet-visible absorbance spectroscopy was used to evaluate protein concentration and percentage recovery. pH tests were conducted on post-transportation samples at Week 0. Protein aggregation was assessed through quantification of high molecular weight (HMW) species using size-exclusion ultra-high-performance liquid chromatography (SE-UHPLC). Purity was examined using cation-exchange high-performance liquid chromatography (CEX-HPLC) and reduced capillary electrophoresis sodium dodecyl sulphate assays. Subvisible particles were counted by light obscuration (HIAC), using a HIAC/Royco liquid-borne particle counter with an HRLD-150 laser using Pharm Spec software. *In vitro* cell-based proliferation inhibition assays used human breast tumour cells (BT-474) expressing HER2 receptors to evaluate potency.

Results/key findings: For both ABP 980 and reference trastuzumab, visible particles (>125 µm) were intermittently observed across storage temperatures, with increased subvisible particles seen in low doses. For both products, higher dose dilutions maintained the pH closer to the original formulation than the lower doses. There was little change in the percentage of HMW species across doses and temperatures as measured by SE-UHPLC for either product, and while CEX-HPLC analysis demonstrated significant loss in the main peak (intact molecule) over time at 30°C, no significant loss in intact molecule was

observed at 2–8°C. There was no detectable loss in purity across doses and temperatures by rCE-SDS, indicating stability with respect to fragmentation for both products. HIAC measurements showed that subvisible particle levels were generally consistent with ABP 980 and reference trastuzumab at both dose concentrations, with increased subvisible particle counts observed at low doses. The increased particle counts with low doses of ABP 980 and reference trastuzumab may be due to dilution of the surfactant (polysorbate 20) below its effective concentration; however, these low doses are rarely used in the clinic. *In vitro*, there was consistent biological potency of 97–114% across doses (97–104% for low-dose and 102–114% for high-dose) and temperatures (98–114% at 2–8°C and 97–113% at 30°C) for both products.

Conclusion/recommendations: Across storage temperatures, a robust set of stability-indicating assays showed that ABP 980 and reference trastuzumab demonstrated consistent product quality. These results provide assurance that ABP 980 retains stability and activity over extended storage periods.

Funding: This study was funded by Amgen Inc.

101

Immunotherapy for malignant melanoma: single institution experience

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Objective/purpose: The advent of immunotherapy has revolutionised systemic anticancer treatment (SACT) for advanced melanoma.

Pembrolizumab was accepted by the Scottish Medicines Consortium in November 2015 for treatment of advanced (unresectable/metastatic) melanoma in adults based on extended median progression-free survival and overall survival compared with ipilimumab.

Immunotherapy shows great potential for long-term control of cancer in some patients, but it has novel immune-related toxicities compared with cytotoxic chemotherapy which are still not well recognised in non-specialist settings.

An audit of pembrolizumab monotherapy in metastatic melanoma was carried out to compare outcomes of NHS Highland patients with pivotal trial results (Keynote 006), including overall survival and toxicities.

The work aimed to identify factors to predict positive/negative outcomes and improve cost-effective use of immunotherapy in malignant melanoma.

Study design/methods: Patients diagnosed with metastatic malignant melanoma in the period February 2016 to June 2018 were identified. Data were retrieved from the records of patients treated with pembrolizumab – duration of treatment, overall survival, toxicities, reason for stopping treatment, presence of brain metastases at initiation, prior therapy, BRAF status, baseline LDH, performance status, age, description of disease site and severity.

Results/key findings: Thirty-three patients were identified. The audit population comprised 17 patients who started treatment with pembrolizumab before June 2018, of whom 16 have at least one year's follow-up.

Approximately 50% of all identified patients were male and 30% were BRAF mutant. Median age was 67 years (range 41 to 86).

Toxicities occurred in almost all patients who received more than one cycle. Toxicities were managed with symptomatic treatment, topical/systemic steroids and withholding immunotherapy. Toxicities included: hypophysitis, hypogonadism, thyroid dysfunction, arthralgia/myalgia, spongiotic dermatitis, renal impairment, fatigue, dry mouth.

Crude one-year survival was 56%. Median survival was not reached at data censoring, with a maximum of 26 months' follow-up. Eight patients died (seven within four months of starting treatment), three were still alive but had progressive disease, two had treatment ongoing, and four patients had complete responses.

Complete response NHSH: 23.5%; Keynote 006 (combined arms long-term follow-up presented ASCO 2017) 13%.

Crude 12-month survival NHSH: 56.3%; estimated 12-month survival (Kaplan-Meier) Keynote 006 68.4%.

Conclusion/recommendations: Performance status >1 and/or presence of brain metastases was strongly associated with poorer outcomes. Locally, following

this project, cost-effective use of immunotherapy for this indication has improved because of better selection of those patients who are likely to live long enough to benefit from the treatment.

Overall, results were comparable with the pivotal trial, taking into account limitations such as patient numbers and retrospective nature of the analysis. Four complete responses is a remarkable result in the setting of metastatic malignant melanoma.

Future work will address further analysis of factors relating to outcomes (e.g. baseline LDH, disease bulk/tempo) and considerations relating to stopping treatment in responders.

Funding: NHS Highland.

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Providing an out-of-hours chemotherapy/monoclonal antibody service without an out-of-hours aseptic unit at the Queen Elizabeth Hospital, Birmingham

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University Hospital Birmingham NHS Foundation Trust, Birmingham, UK

Objective/purpose:

Introduction: Chemotherapy and monoclonal antibodies (MABs) requested out of hours (OOHs) at the Queen Elizabeth Hospital, Birmingham used to be ordered via an external company. The company closed down May 2017, resulting in a change to the OOHs process. A list of emergency chemotherapy and MABs, including doses and indications, was devised by consultants and clinical pharmacists from the relevant specialties. The aseptic unit now holds ready prepared stock of the products on this list, so they can be dispensed out of hours by the oncology/haematology pharmacist on call. Only products on this list can be supplied OOHs under the new service.

Objectives: Determine what impact the new out OOHs chemotherapy/MAB service has on:

- Financial cost
- Number of supplies of chemotherapy/MABs out of hours

Study design/methods: The expenditure on OOHs chemotherapy/MABs via the external company was collated from January 2016 to May 2017. This included the monthly fee as well as charge for each request. This was compared to the expenditure on wasted products held for OOHs use from May 2017 to December 2018.

The number of OOHs requests for chemotherapy/MABs via the external company was collated from January 2016 to May 2017. This was compared to the number of dispensed chemotherapy/MAB products OOHs from May 2017 to December 2018.

Results/key findings: Average monthly expenditure on OOHs chemotherapy/MABs January 2016–May 2017 = £3010.

Average monthly expenditure on OOHs chemotherapy/MABs May 2017–December 2019 = £901.

Average number of OOHs supplies of chemotherapy/MABs each month January 2016–May 2017 = 3.47 items.

Average number of OOHs supplies of chemotherapy/MABs each month May 2017–December 2019 = 0.35 items.

Conclusion/recommendations: The new OOHs chemotherapy/MAB service has reduced the financial cost, with an average cost saving of £2109 a month. The new service has also reduced the number of OOHs supplies of chemotherapy/MABs. This is beneficial as the risk of incidents is increased when complex cytotoxic regimens are administered OOHs, particularly errors including incorrect drug and patient identification as well as incorrect route of administration.[1]

The benefits of the new service have been supported by the aseptic unit opening on Saturdays 9:00–13:00 as well as a specialised oncology/haematology pharmacy on call service being developed. The reduction in OOHs supplies of chemotherapy/MABs and financial savings may not have been as significant without these developments.

Reference

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Use of biomarkers to detect cardiotoxicity induced by anti-cancer medications: A systematic review of literature

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Objective/purpose: Chemotherapy-induced cardiotoxicity is a significant adverse drug event which restricts the benefits of anti-cancer therapy and limits the quality of life of the patients. Echocardiography, mainly the left ventricular ejection fraction (LVEF), is the main parameter to diagnose cardiac dysfunction induced by anti-cancer therapy. However, this type of imaging is not sensitive enough to capture early subclinical myocardial alterations. Limitations of echocardiography underscore the need for new diagnostic and monitoring strategies. The use of biomarkers for this endeavour is under investigation to gauge value as a predictor of early stage cardiotoxicity. The aim of this project was to conduct a systematic review of the literature on this topic.

Study design/methods: A systematic review was carried out according to PRISMA guidelines. PubMed®, SciFinder® and Google Scholar® were queried using pre-specified keywords. Inclusion criteria were for those studies examining the association between biomarkers and echocardiography with anti-cancer medicine as the causative agent. Exclusion criteria included: non-English language studies, publications older than 10 years, animal and paediatric studies.

Results/key findings: A total of 502 articles were identified; 128 articles were excluded due to duplicates, non-English language and >10 years old. Title and abstracts of 374 articles were screened. Eligible articles were transferred to full-text screening, quality and quantity assessment and for final decision. The reviewed studies revealed the following: LVEF was the most frequently used parameter of echocardiography and cardiac troponins and natriuretic peptides were the most studied biomarkers. According to these findings, cardiac troponins and N-terminal pro-brain natriuretic peptide are strong predictors of chemotherapy-induced cardiotoxicity.

Conclusion/recommendations: Cardiac dysfunction induced by anti-cancer medications is a serious side effect, which restricts the quality of life. Cardio-oncology researchers are ongoing for novel techniques to diagnose cardiotoxicity earlier in cancer patients. Alterations in cardiac troponins and N-terminal pro-brain natriuretic peptide are associated with cardiotoxicity but need further investigation for prospective validation.

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Analyzing the causes of disposal of the prepared chemotherapy drugs

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Objective/purpose: Ordered protocols for patients receiving chemotherapy are prepared after being checked by the pharmacist. However, it was seen that some of the prepared drugs were disposed off for various reasons. The aim of this study is to determine the causes and reduce the rate of drug disposal, and thus to guide the corrective improvements in order to prevent the loss of labor and sources.

Study design/methods: A standardized form for recording the causes of drug disposal in patients receiving chemotherapy was used to investigate the causes of disposal. The form was added to the quality documents of the hospital and was announced to the clinics through the hospital software system. In case that chemotherapy drugs were to be disposed off and then re-ordered to be prepared, this form would be filled out and sent to the hospital pharmacy chemotherapy unit. These record forms filled out in 2018 were reviewed and analyzed in terms of types, causes and rates of disposal. Disposal types included factors such as ordering, preparation, administration, storage conditions, patient's clinical status, patient, equipment used in the preparation and/or administration and others.

Results/key findings: 56.49% of the causes of disposal were keeping the drug on hold due to patient's unsuitable clinical status for treatment and obligation for disposal upon expiration of stability period. Percentages of other causes of disposal were found to be as 7.14% (preparation), 6.49% (administration), 12.98% (giving order), 3.24% (inappropriate storage), 2.59% (patients) and 7.16% (other).

Conclusion/recommendations: The major part of the results (56.49%) showed that treatment protocol orders should not be sent to the preparation unit, and the drugs should not be prepared without adequate examination of patients who come for treatment and evaluation of clinical results. The

corrective improvements should start from the stage of patient examination and evaluation of test results and clinical status. Determining the reasons for the disposal of the prepared drugs may enable chemotherapy centers to find out in which stages of the process there are problems in chemotherapy treatment units. Improvements for the identified problem play an important role in preventing drug losses and thus financial losses.

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Canadian online learning initiative positively impacts fundamental oncology knowledge, confidence, and practice change for pharmacy practitioners

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Objective/purpose: Oncology Fundamentals Day (OFD) is a pan-Canadian, online, interactive event delivering introductory-level oncology pharmacy education annually since 2016. Our objectives included examining attendee perspectives regarding the OFD 2017 program, the impact of OFD 2017 on oncology knowledge and confidence for participants, and exploring the connection between OFD 2016 attendance and oncology related practice change 12 months after the event.

Study design/methods: The OFD 2017 program entailed the topics of cancer screening, prostate cancer, gynecological cancers, myeloproliferative neoplasms, bone marrow transplant, complementary medicines, cancer pain management, immunotherapy toxicity management, and oncologic emergencies. Three weeks after the event, all 219 registrants were invited by a third party to complete a voluntary and anonymous survey designed on Qualtrics®. This study plan was approved by the University of Alberta Research Ethics Office (REO).

Results/key findings: Forty-nine registrants (22%) completed the survey and 46 met inclusion criteria. Self-assessed moderate to substantial improvement in knowledge was reported in 32 respondents (70%) for oncology diseases, 27 respondents (59%) for oncology pharmacotherapy, 29 respondents (63%) for oncology therapy-related toxicities, and 26 respondents (57%) for cancer-related symptoms. Twenty-five respondents (54%) matched the program target audience as they had minimal oncology experience or a practice focus outside of oncology. Within the target audience, 23 (92%) agreed the presentation complexity and length were appropriate. Nineteen (76%), 17 (68%), 18 (72%), and 16 (64%) indicated moderate to substantial improvement in knowledge related to oncology diseases, cancer pharmacotherapy, oncology therapy-related toxicities, and cancer-related symptoms, respectively. Fourteen (56%) indicated moderate to substantial improvement in their confidence to provide care for patients with cancer. Twenty-two survey respondents (48%) participated in OFD 2016 and OFD 2017. Of these, 13 (59%) indicated they had applied what they learned from OFD 2016 to their practice, 11 (50%) noted an improved level of confidence in providing care to cancer patients, 12 (55%) reported an improvement in their ability to provide care to cancer patients, and 19 (86%) noted an increase in motivation for further professional development in oncology.

Conclusion/recommendations: Delivery of an annual online interactive oncology conference continues to facilitate improved oncology knowledge and confidence for participants, including those with limited oncology experience or with a practice focus outside of oncology. For repeat attendees, content learned from the previous offering had a lasting impact on their practice, with approximately half indicating an improvement in confidence and in their ability to provide care to patients with cancer. OFD attendance positively impacts motivation to engage in future professional development and educational opportunities related to oncology. Given the results, OFD will continue to be offered on an annual basis.

Funding: Administrative support provided by Canadian Association of Pharmacy in Oncology (CAPhO). CAPhO is a not-for-profit organization that supports and advances oncology pharmacy practice.

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Medication waste management: Challenges and opportunities in ambulatory cancer centre

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Objective/purpose: To identify the challenges and opportunities related to mediation waste management.

Study design/methods: Patients and caregivers at National Cancer Centre Singapore were surveyed during a two-week medication waste management campaign. Healthcare professionals answered an online survey with similar questions. Data from the surveys were analysed using SPSS Statistics 25.

Results/key findings: A total of 175 patient and caregivers, and 254 healthcare professionals were surveyed. The most common reason for unused medication was 'condition resolved' (43.4%) and 75.4% of respondents disposed of their medications into a trash bin. The majority (85.7%) of those surveyed were unaware of the recommended disposal practices for medications. Both populations felt a need for medication disposal points to be set-up (74.9%, 87.8%). Respondents opted for 'limit dispensing supply' and 'limit prescription duration' as methods to reduce medication waste. Patients and healthcare professionals differ in their ranking of proposed methods of reducing drug waste, with 'frequent medication reconciliation' as top choice for healthcare professionals (70.9%) but fourth for patients (17.1%), as well as frequency of drug waste management campaigns, where healthcare professionals prefer between every three and six months (63.9%), while patients prefer more frequent campaigns at three months or less (61.8%).

Conclusion/recommendations: The results of this study have revealed existing gaps in our management of medication waste and provided possible solutions to reduce medication wastage. Future efforts should include studies with national agencies to understand and ease the process of medication waste management.

Funding: Department Fund.

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An audit of the use of pegylated interferon in patients with myeloproliferative neoplasms. Are patients maintained on less frequent dosing than once weekly?

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Objective/purpose: Pegylated interferon (peginterferon) is commonly used as cytoreductive agent for myeloproliferative neoplasms (MPN); however, this indication is unlicensed. Within the East Midlands, pegylated interferon is routinely funded for patients who are intolerant of standard short-acting interferon-alfa.

This analysis was undertaken to establish:

- Indication for use (including diagnosis and mutational status) and whether use is in line with East Midlands commissioning policy
- Discontinuation rate and reason for stopping
- Starting and maintenance dosing

Anecdotally at the NUH, pegylated interferon has been administered less frequently than once weekly. A secondary aim was to establish the proportion of patients dosed less frequently than once weekly.

Study design/methods: A single-centre, retrospective analysis of case notes, for adult patients who received peginterferon was undertaken. Patients were identified through dispensing records dated between February 17 and November 18 via the pharmacy stock management system. Patients were excluded if they did not have a diagnosis of MPN.

Results/key findings: Twenty-five patients (age range 20–84 years) were identified as having received at least one prescription for pegylated interferon between February 17 and November 18. Of these, 60% (15) of patients were diagnosed with essential thrombocythaemia (ET), 28% (7) Polycythaemia Vera (PV) with the remaining patients either MPN – unclassified, ET/PV overlap or Post-ET Myelofibrosis. Eighty-six percent of PV patients carried the JAK-2 V617F mutation (one not documented). Forty percent of ET patients were CAL-R mutated and 33% JAK-2 V617F mutated.

Peginterferon was initiated in 56% (14) of patients following intolerance to standard short-acting interferon. A further four patients (16%) were predicted to not tolerate standard interferon. For the

remaining 28%, reasons for initiation were intolerance/treatment failure associated with other therapy or was not documented. Thirty-six percent (9) patients discontinued peginterferon. The most common reason for discontinuation was toxicity relating to thyroid function, which occurred in approximately 12% of patients.

Most patients (64%) were initiated on a starting dose of 90 μg weekly, with 16%, 8% and 12% started on 45, 135 and 180 μg once weekly, respectively. Once stabilised, over 50% of patients required less frequently dosing with a minimum interval of fortnightly injections (range 2 to 6 weeks).

Conclusion/recommendations: Historically, pegylated interferon has been reserved for patients intolerant to standard interferon-alfa due to the lack of comparative data between peginterferon and standard therapies or standard interferon-alfa. However, recent phase 3 data have shown peginterferon to be equivalent to hydroxycarbamide.[1]

This audit demonstrated that peginterferon was started in 28% of patients who had not previously received standard short-acting interferon-alfa or started where predicted non-tolerance was not documented. This warrants further investigation. However, as over 50% of patients required dosing less frequently than once a week, based on NUH prices and a standard interferon-alfa dose of three million units three times a week, peginterferon therapy is cheaper.

A CNS-led project is currently ongoing at the NUH to evaluate patient experience of peginterferon following standard interferon. This will further inform whether peginterferon should routinely be offered first line where interferon is indicated.

Reference

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Increasing pharmaceutical care offer by implementing process improvement methodologies in an outpatient oncology infusion unit

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Objective/purpose: Pharmaceutical consults are beneficial to patients, but healthcare insurance providers do not pay for those services in Brazil, which limits our capacity to offer them to our patients. At Assistencia Multidisciplinar em Oncologia, there are eight pharmacists who provided pharmaceutical consults to an average of 180 patients per month between January 2018 and June 2018. A project was developed to evaluate and redesign pharmacy workflows, aiming to increase time available for pharmaceutical consults, and allow for delivery of consults to 50% more oncology patients by December 2018.

Study design/methods: A process map was developed to identify each step in our process. A tally sheet was used to calculate the capability of each component in the process. Brainstorming allowed for the analysis of data, identification of waste, and steps which contributed to errors. A Cause and Effect diagram was used to identify errors such as unnecessary product transfers, delay of tests results, errors in parameters set in our electronic medical record (EMR) and preparation of premedications after patient arrival. Using a priority matrix, an action plan was developed and implemented for changes in the process using the Plan-Do-Study–Act (PDSA) cycle.

Results/key findings: By December 2018, 65% of PDSA items were implemented, such as reducing the number of product transferred among warehouses, preparation of premedications once a week, and adjustments of parameters in the EMR. There were some unexpected impacts to other areas because of changes implemented in PDSA 1, which required us to re-evaluate the PDSA process. Having evaluated the process, our measurement showed a 13.8% reductions in steps needed in the pharmaceutical distribution process from 108 steps to 93 steps. Furthermore, pharmacist time spent was reduced by 30 min to 25 min, without decreasing care quality. An average increase of 44% was achieved in the pharmaceutical consults, attending an average of 260 patients per month.

Conclusion/recommendations: Reductions in process waste lead to increased capacity for consults. The use of process maps and defined workflows allowed for improvements in pharmacist's workflows, including improved efficiency of consults. Due to certain process setbacks, not all achieved changes were sustained. Starting February 2019, a second PDSA cycle will be implemented to address the setbacks. Using lean and six sigma methodologies learned during our American Society of Clinical Oncology

(ASCO) Quality Training Program, we were able to achieve a great amount of improvement in a short period, saving time and resources with this project.

Funding: This project was conducted with support from ASCO Mission Endowment.

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Health care professionals underestimate patient needs for medicines information: A cross-sectional study of Australian radiation oncology outpatient services

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Objective/purpose: Patients receiving chemo-radiotherapy can have complex medication requirements related to the management of side-effects and impaired swallowing ability. The side-effects include mucositis, dysphagia, orofacial pain, nausea, xerostomia, dental issues and sustained weight loss. If not adequately treated, they often result in substantial suffering, treatment interruptions and premature treatment discontinuation. Toxicities are managed via combinations of opioid and non-opioid systematic or topical analgesics, antiemetics, prokinetic agents, aperients, anxiolytics, mouthwashes, emollients and others. Furthermore, in the outpatient setting, there is a heavy reliance on patient's own involvement of their care and the ability to appropriately manage medications to alleviate symptoms. To date, there are limited studies exploring patient's views on medication self-efficacy and adherence with supportive care medications. This study surveyed patients and clinicians to identify service gaps and unmet medication management needs to inform development of outpatient pharmacy services in this setting.

Study design/methods: Patient and clinician surveys were developed by a multidisciplinary team consisting of radiation and medical oncologists and pharmacists. The patient survey focused on medication use and adherence. It was disseminated to patients aged over 18 years who had received at least four weeks of radiotherapy for the treatment of head and neck cancer. The clinician survey was a clinical case-based questionnaire, which aimed to describe current patterns of practice and identify perceived service gaps across different radiotherapy centres. This survey was disseminated to radiation oncologists, pharmacists and nurses involved with the care of head and neck or lung cancer patients in Victoria Australia.

Results/key findings: A total of 93 surveys were completed including 53 patient surveys (62% response rate) and 40 clinician surveys (57% response rate). Patients reported high medication use with polypharmacy, defined as taking five or more medications, reported by 53% (28 of 53) of patients. When asked the same set of questions relating to medication education, patients receiving polypharmacy reported greater needs (72%, 20 of 28) than recognised by the surveyed multidisciplinary team (58%, 54 of 93). In the polypharmacy cohort, 46% (13 of 28) reported medication adherence issues such as difficulty in remembering to take their prescribed medications. Half of the responding clinicians reported medication safety concerns, particularly surrounding medication administration via enteral feeding tubes. Clinician practices varied in relation to the provision of some supportive care medications such as the use of cocaine mouthwash and approach to the management of chemoradiation emesis. This is likely to reflect neutral evidence and availability of multiple alternate options. Whilst all reported approaches were deemed appropriate, disparities in prescribing patterns may incite confusion amongst patients seen by multiple practitioners. Patients expressed willingness for further pharmacy support with 75% (40 of 53) wanting more written educational material and adherence aids.

Conclusion/recommendations: Oncologists, nurses and pharmacists underestimated patient needs for medication information, education and follow-up. In addition, polypharmacy and medication adherence issues were identified in a large proportion of patients. Findings support integration of pharmacy services within a multidisciplinary radiotherapy team to improve patient care and bridge service gaps relating to medication management.

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Streamlining the delivery of chemotherapy for lymphoma patients

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Objective/purpose: Patients with non-Hodgkin's lymphoma (NHL) receive up to six courses of chemotherapy; throughout treatment, dose adjustments may be required to manage toxicities. Within our institutional policy, prescribing and pharmacy screening must be completed at least 72 h and 48 h before the scheduled treatment date, respectively. Late prescribing and/or clinical pharmacy screening can impact on service workflow and incur late aseptic order charges.

In order to streamline the delivery of chemotherapy to NHL patients, the aim was to examine the feasibility of introducing "*advance prescribing*", where planned courses of chemotherapy are pre-prescribed; patients are subsequently reviewed during the course of their treatment and any dose adjustments introduced in subsequent courses as clinically indicated. Before implementing this new approach, the objectives were to:

1. Evaluate current process and workflow (in) efficiencies
2. Assess the frequency, pattern and reasons for dose adjustments

Study design/methods: A retrospective review of NHL patients treated between June 2016 and June 2018 was undertaken. Patients who received R-CHOP, R-miniCHOP, R-CVP, R-GCVP and R-bendamustine chemotherapy were identified from the chemotherapy electronic prescribing system. The timelines between prescribing, screening and the scheduled treatment date of all prescriptions were retrieved and reviewed against institutional targets. Prescribing data, including chemotherapy dose adjustments, were extracted for all cycles received; reasons for any dose adjustments were reviewed against medical records. Ethics approval was obtained via the University of Reading.

Results/key findings: A total of 206 patients received 215 treatment plans and 933 chemotherapy courses; R-CHOP and R-miniCHOP was prescribed for 145 patients; 25 received R-CVP; 25 received R-bendamustine and 20 patients received R-GCVP. One third (30%; n = 276/933) of all prescriptions did not meet our institutional target timelines for prescribing and screening.

The observed frequency of patients requiring dose adjustments at any time during their treatment plan was 31% (n = 65/206). A total of 103 dose adjustments were made; the majority being prior to initiating treatment and within the first three courses of treatment; 60%, 14% and 11% on cycles 1, 2 and 3, respectively. Only 15% of all dose adjustments occurred beyond cycle 3. Sixty per cent of all dose adjustments were due to performance status (19%) and predicted toxicities: haematological (15%), liver impairment (12%), and neurotoxicity (12%).

Conclusion/recommendations: These data showed that one third of all courses are not prescribed within the target timelines, which causes avoidable pressures on the service and has financial implications due to late order costs. The data also suggest that only a small proportion of patients required dose adjustments after the third course of chemotherapy, often due to predictable and manageable toxicities. Clinicians could therefore pre-prescribe the remaining courses of treatment to selected patients after their interim disease response assessment. Before proceeding with chemotherapy, patients will be subsequently reviewed in the day treatment unit to ensure they are fit for chemotherapy and all assessments are within safe parameters. 'Advance prescribing' could be introduced and has a potential role to improve workflow and cost efficiencies. There is also scope for a non-medical prescriber to review these patients for a better skill-mix.

Funding: This project was supported by the Undergraduate Research Opportunities Programme (UROP) at the University of Reading.

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Development of advanced clinical pharmacy technician roles and responsibilities at the Oxford University Hospitals NHS Foundation Trust (OUHFT)

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Objective/purpose: The OUHFT cancer centre workload has increased by 10–12% annually due to a mixture of increased number of cancer drugs, regimens, prescribing complexities and increased patient survival. This all led to the cancer pharmacy team reconfiguration in 2018 – to aid recruitment and retention in line with other trusts benchmarked nationally. Two vacant band 7 cancer pharmacist posts were converted to band 7 advanced technician posts.

The aim of the new posts were to operationally lead in clinical areas, in line with the pharmacy

operational pharmacy technician band 7 job description, and to take on some of the roles of bands 7 and 8 cancer pharmacists. The aim was to free up pharmacist time for other duties (e.g. non-medical prescribing), and to use the skills of experienced cancer pharmacy technicians to support the clinical workload traditionally undertaken by pharmacists. The band 7 technicians would also undertake training to validate simple SACT repeat prescriptions.

Study design/methods: Details of roles and copies of job descriptions and person specifications were requested for senior pharmacy technicians from other Cancer Centres nationally. The Christie Hospital in Manchester and the Northumbria Healthcare NHS Foundation Trust were contacted to request details of technician validation roles, where similar models of work were previously carried out. These were used with our trust's current band 7 technician job descriptions to design a job description for this new role.

Results/key findings: Key roles of advanced technicians are:

- To be operational manager, line manager, leader and role model in cancer pharmacy and responsible for the technical staff.
- To validate specific repeat systemic anti-cancer treatment (SACT) prescriptions
- To work in the oral education clinics to educate and advise patients starting on oral SACT
- To work on the wards and day treatment units (DTUs) to provide medicine management services
- To develop, lead and maintain extended roles for technicians including accredited technician checking, medicines management, patient education and counselling.
- To be involved in the preparation of new drug submissions for the Trust Medicines Management and Therapeutics Committee (MMTC)
- To act as knowledge base/resource for the specialist area and to keep up to date in the specialist area.

Conclusion/recommendations: These two new roles have enabled pharmacy technicians to provide cross-cover support to both the pharmacy technicians and the pharmacists. Due to the level of knowledge and experience in the team, the advanced technicians have been able to take on more tasks and responsibilities that have previously just been undertaken by pharmacists. This is an exciting and encouraging time for technicians. Not only can a clear progression path be seen, but this new role emphasizes the benefits of specialising in cancer medicines and becoming competent with all cancer procedures and pathways. The advanced technicians can be seen to be good role models for their knowledge and experience for the team, and nationally. The benefits of the restructure are in line with the trust values and will ensure that the pharmacy team can continue to deliver an excellent service that continually improves and benefits both staff and patients.

Funding: OUHFT.

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Height and weight reporting frequency for BSA and weight-prescribed chemotherapy and its impact on weight change interpretation in an acute hospital? A retrospective audit

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Objective/purpose: Weight changes during cytotoxic chemotherapy affect morbidity, mortality and quality of life. The systemic anti-cancer therapy (SACT) dataset provides intelligence on chemotherapy prescribing in the UK. Height and weight at the start of a regimen are mandated SACT fields with a medicines optimisation CQUIN (MO-CQUIN 2017–2019) requiring 98% data reporting compliance. Cycle level weight reporting is a SACT data field but not covered by the MO-CQUIN. Local concerns regarding potential gaps in the recording, monitoring and utilisation of cycle level weights in IV cytotoxic chemotherapy prescribing informed its inclusion. The audit was undertaken to establish acute hospital (NUH) compliance with prescribing system recording of:

1. Height and weight at start of regimen
2. Weight prior to each cycle

The secondary aim was to establish timeliness of weights relative to treatment and the impact of weighing frequency on establishing percentage weight change during treatment.

Study design/methods: A retrospective audit was conducted of adult patients (18 years +) receiving chemotherapy across six cancer pathways from June to December 2017 at the NUH. Data were extracted from ChemoCare for authorised treatments prescribed using weight or body surface area (BSA).

Standards were reported as percentage (%) compliance (number of patients, range). The timeliness of weights used for prescribing was described by the median number of days (range, IQR) between a cycle and recorded weight. Percentage weight change was reported as % of patients who lost, gained or maintained weight.

Results/key findings: Over six months, 1018 patients received 3801 cycles of treatment dosed by BSA or weight. In 986 patients, 3707 cycles were included in the final analysis. 100% of regimens had a recorded height and weight at the start of each regimen. Only 25.5% (n = 251, 15–47.1%) of patients had a recorded weight in ChemoCare for all cycles of treatment. There was a median of 13 days (0–785 days, IQR 39 days) between ChemoCare recorded weights and an associated treatment cycle. There were also 217 outlying cycles with >38 days between the ChemoCare weight and treatment cycle.

Weight change over treatment cycles indicated 30.9% (n = 315) of patients lost weight, 24.4% (n = 248) gained weight, 44.7 % (n = 455) showed no weight change. Of the patients showing no weight change, over half (n = 239) received more than one cycle of treatment but had only one recorded weight.

Conclusion/recommendations: Interpretation of weight change was hampered by 23.5% of patients only being weighed once over multiple treatments. An IQR of 39 days infers weights reported in the SACT upload may not reflect weights at the time of treatment. One palliative patient's weight was 789 days before treatment; the impact of weight loss on cytotoxicity in palliation is less well described.

Digitalisation of chemotherapy prescribing has supported data collation but may have a negative impact on frequency of weight recording. Mandated weights within seven days of a cycle would enable more accurate assessment of weight change. This audit has informed a digital nutrition outpatient screening pilot, to assess nutritional risk, support height and weight validation and aid data synthesis to support understanding of weight change on cytotoxic chemotherapy prescribing.

Funding: Macmillan regional partnerships fund – East Midlands.

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A real-world data approach to determine the optimal dosing strategy for pembrolizumab

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Objective/purpose: Cancer drug therapy costs continue to rise and threaten the sustainability of Canada's public healthcare system. Previous studies have calculated potential savings utilizing different dosing regimens of cancer treatment medications. This study investigates the usage of pembrolizumab through actual compared to optimal usage, wastage and cost and compares alterative dosing regimens for potential cost-effectiveness.

Study design/methods: This was a multi-centre study reviewing retrospective usage and wastage data for non-small cell lung cancer (NSCLC) and melanoma patients at all six BC Cancer centres for one fiscal year.

Part One: Comparisons were made between actual and optimal wastage amounts to determine usage and accuracy of wastage logs. Actual usage was calculated from order reports and inventory counts; actual wastage was recorded from wastage logs. Optimal usage and wastage were calculated from dispensing data, assuming that the minimal number of vials were used to minimize wastage. Optimal usage costs were compared to determine theoretical savings with and without vial sharing.

Part Two: Usage costs were calculated with 50 and 100 mg vials for 2 mg/kg dosing to a maximum of 200 mg, dose banding within 5 and 10 percent and 200 mg flat dosing.

Results/key findings: Year one data show that there were a total of 54 NSCLC and 118 melanoma patients with 937 doses administered. Documented drug wastage was valued at $492,709.80 CDN on a total spend of $7,055,705.80 CDN (6.98%). Of note, in year one, both 50 mg and 100 mg vials were available.

Centres with the highest total usage had the highest opportunity for vial sharing. Centres with little opportunity for vial sharing benefitted the least economically. Across all centres, vial sharing could potentially save a further $378,400 CDN.

Dosing 2 mg/kg to a maximum of 200 mg with vial sharing saved $418,000 CDN over flat dosing of 200 mg.

Conclusion/recommendations: Drug wastage has become a significant cost to the system. Year one data for one Canadian province showed that almost 7% of the total spend on pembrolizumab was on drug wastage. Although flat dosing would eliminate wastage, it also increases the cost of treatment, in a setting where there is documented evidence to suggest that weight-based dosing is equally effective. Using real-world data on wastage and dosing, different dosing strategies were investigated in this study, to assess the potential impact on costs of treatment. Having multiple vial sizes, dose banding and weight-based dosing all improve cost savings. Further investigations on the allocation of resources to optimize drug use and minimize wastage are needed.

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Lean synchronisation application of service redesign to chemotherapy pathway in a cancer centre

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Objective/purpose: In 2016/2017, NHS England and the CDF spent £1.7billion on SACT. Increasing incidence of cancer, an aging population and a growing funding gap the NHS needs to achieve "more for less" without compromising quality of services.

The objective of this study is to analyse the impact of implementing dose banded chemotherapy and redesigning the chemotherapy pathway within the Cancer Centre on quality, particularly patient experience, efficiency and wastage.

Study design/methods: Implementation of dose-banding tables provides an opportunity to the use of batch chemotherapy, moving away from bespoke products. The primary outcomes of this are reduction in cost, waste and patient waiting times. Order data of bespoke products for a year were analysed alongside stability and storage conditions for inventory management.

Patient waiting times in the two day-care units were collected retrospectively from Chemocare and QlikView along with the percentage of cost reduction of chemotherapy wastage was collected pre- and post-implementation. Change implementation was preceded by a process mapping of the service delivery to enable identification of bottlenecks for service re-design.

The bottlenecks were identified at the confirmation process and the drug reconstitution stage. The service redesigned to enable treatment to be confirmed 48 h prior to patients' appointment, thereby increasing time for reconstitution. Additionally, the increased use of dose-banded treatment increased flexibility for dose alteration and lowering cost.

Results/key findings: Waiting time data were collected from June to October 2018, totalling 4836 appointments on the chemotherapy administration day-care units; these data were compared to the post implementation data of 4538 appointments collected between December 2018 and April 2019.

Patient waiting time pre-implementation on Ambulatory Care Unit (AC 10) ranged between 1 h 27 min and 2 h 5 min, and post implementation waiting time was reduced to 1 h 27 min to 1 h 35 min. Post implementation the waiting time was reduced to 1 h 27 min to 1 h 35 min. The waiting time for chemotherapy day unit (CHS) pre-implementation was ranging between 2 h min and 2 h 50 min, post implementation patient waiting times ranged between 1 h 29 min and 1 h 49 min. The p value of 0.006 indicates that there is a significant difference in waiting time before and after implementation of the new pathway on CHS.

A reduction of 20.8% in the value of waste through the introduction of dose-banded chemotherapy and service redesign was observed. There was also an overall reduction in costs to the health economy due to a reduction in chemotherapy procurement costs which was primarily due to the lower cost for batch production of doses versus bespoke chemotherapy.

Conclusion/recommendations: Aseptic compounding is the challenge facing in the cancer services within the NHS. This study shows that even large cancer centres can implement service changes, such as

increasing the use of dose-banded drugs and confirmation of chemotherapy in advance to reduce the burden on aseptic units to produce bespoke doses at short notice. The continued monitoring of patient waiting times and inventory management will ensure the system remains fit for purpose and is adapting to changes in patient needs and the NHS commissioning environment.

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Real-world experience of a standalone robotic device for compounding of patient-specific antineoplastic preparations in an ambulatory care pharmacy

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Objective/purpose: The purpose of this study is to describe our experience of implementing and utilising a second generation compounding robot (APOTECAchemo) for preparations of patient-specific antineoplastic medications.

Study design/methods: Computer-generated data from robot software over a period (August 2017 to March 2019) was utilised. We looked at the percentage ''pass'' or ''fail'' (±5% deviation) of chemotherapy prepared to analyse the efficiency of the robot. We investigated the number of days the robot was operational vs. not operational and the reasons behind that. We compared productivity of robot with manual preparation process; evaluated and explored challenges during its implementation and how best to incorporate the robot into daily operational workflow.

Results/key findings: The total number of antineoplastic medications prepared over the study period was 67,200 doses. The number of manual preparations was 52,749 doses (78%) and 14,451 (22%) prepared by the robot. From August 2017 to December 2017, the robot prepared 4065 antineoplastic medications, 3915 passed (96%) and 150 failed. From January 2018 to December 2018, the robot prepared 6954 antineoplastic medications, 6724 passed (97%) and 230 failed. From January 2019 to March 2019, out of 3432 cytotoxic medications, 3,329 passed (97%) and 103 failed. Out of the total number of antineoplastic medications prepared by robot (14,451), 13,968 passed (97%) and 483 failed (3%). The downtime of the robot due to lack of specific consumables (Baxter bags, specific needles, etc.) was four months (21%) of its operational time. No downtime was observed for software and hardware issues.

The average time to prepare antineoplastic medication by the robot was 6 min. The average time for individual drugs are: carboplatin (4 min), cisplatin (6 min), cyclophosphamide (8 min), cytarabine (5 min), dacarbazine (11 min), doxorubicin syringe (2 min), liposomal doxorubicin (7 min), epirubicin syringe (2 min), fluorouracil syringe (3 min), gemcitabine (12 min), ifosfamide (6 min), irinotecan (5 min) and oxaliplatin (5 min). Changing the vial size from 450 mg/45 ml to 600 mg/60 ml for carboplatin for doses (530–540 mg), the time saved per preparation was 58 s. Changing vial size from 50 mg/50 ml to 100 mg/100 ml for cisplatin for doses (70–80 mg), the time saved per preparation was 56 s. Changing the vial size from 100 mg/5 ml to 300 mg/15 ml for irinotecan for doses (250–260 mg), the time saved per preparation was 160 s. The use of pharmacy bulk packages decreased the turnaround time (TAT). The average time for the manual preparations of IV antineoplastic Piggyback was 3.03 min (n = 49) with minimum time of 0.97 min and maximum time of 4.96 min (SD 0.84 min). The preparation of antineoplastic Syringe IV Push (n = 40) was an average of 2.77 min, with minimum of 0.91 min and maximum of 6.98 min (SD 1.31 min).

Conclusion/recommendations: The introduction of robot had a positive impact on the quality of patient-specific antineoplastic medications. No differences were found in TAT compared to the manual procedure. An improvement in efficiency, patient safety, and quality of care was observed. The potential downtime of robot due to unavailability of specific consumables must be considered when planning the workflow in an Ambulatory Care Pharmacy.

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Accuracy of carboplatin dosing in patients with gynaecological cancers

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Objective/purpose: Carboplatin is used in the treatment of gynaecological cancers and is dosed according to the Calvert formula. At UCLH, it is

recommended that an accurate measured glomerular filtration rate (GFR) using EDTA clearance should be performed prior to cycle 1 to dose carboplatin. If this is not possible, GFR should be estimated (calculated) using the Cockcroft and Gault formula and a measured GFR done before cycle 2. It is known that the Cockcroft and gault formula has limitations and can give inaccurate results in some circumstances. The purpose of this study was to:

1. Assess how often an accurate measure of GFR (EDTA result) is available at cycle 1, and where a calculated GFR is used, how accurate this is compared to a subsequently obtained measured GFR.
2. Assess the frequency of delays due to toxicity at cycle 2 where a calculated GFR is used at cycle 1 and a measured GFR becomes available at cycle.

Study design/methods: Retrospective, single centre study. Patients who had received carboplatin AUC 5 for at least two cycles at UCLH between April 2018 and 2019 were identified using Chemocare®. Measured and calculated GFR values, carboplatin doses and data on delays to treatment were extracted from Chemocare® and CDR®.

Results/key findings: A total of 229 patients were identified. One hundred and thirty-one patients (57%) had an EDTA result available at cycle 1. Seventy-three patients (32%) had an EDTA result available at cycle 2 and 13 patients (6%) at cycles 3 or 4. Twelve patients (5%) had no EDTA done throughout the treatment.

Of the 98 patients who did not have an EDTA available at cycle 1 and a calculated GFR was used, 63 (64%) had their carboplatin dose changed when the EDTA subsequently became available. Fifty-two patients had their doses decreased with a mean percentage decrease in dose of 22% (range 8–49%). The mean dose decrease in milligrams was 138 (range 30–340 mg) and 10 patients had a dose decrease of greater than 30%. Eleven patients had their dose increased, mean percentage dose increase of 22% (range 12–40%).

Of the 73 patients where there was no EDTA available at cycle 1 but one was subsequently available at cycle 2, 7 had their cycle 2 delayed due to toxicity. Six of these patients had their carboplatin dose decreased because of the EDTA value.

Conclusion/recommendations: A measured GFR was only performed at cycle 1 in approximately half of patients. Use of a calculated GFR to dose carboplatin may have resulted in under or over dosing of carboplatin and treatment delays. This work highlights the potential differences in dose when a calculated GFR is used as opposed to a measured one. It provides a case for increasing the number of measured GFRs available prior to starting treatment, and future work should investigate how this can be done.

Limitations: Single site study. Data on delays due to toxicity not available for all patients and for beyond cycle 3. Other factors may have contributed to the toxicity, e.g. combination chemotherapy and line of treatment. Dose banding may have affected the extent of dose changes.

Funding: UCLH.

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Assessing treatment default among paediatric oncology patients in a teaching hospital, Ghana

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Objective/purpose: The burden of paediatric cancer continues to soar in lower- and middle-income countries including Ghana. Chemotherapy which has been a life-saving treatment approach is bedeviled with a myriad of challenges which negatively affect treatment outcomes. Key amongst these is patients' default to treatment. The study was aimed at generating a baseline data for the current challenges that contribute to treatment default in order to improve treatment outcomes in a teaching hospital setting in Ghana.

Study design/methods: The study design was cross-sectional prospective and was conducted at the Paediatric Oncology Unit (POU) of Komfo Anokye Teaching Hospital (KATH), the second largest teaching hospital in Ghana from September to November 2018 after ethical approval was obtained. The POU serves about 35 patients weekly. Fifty percent of the patients of age 12 years and below were recruited weekly for 10 weeks. A sample size of 175 was estimated for the study, of which 140 consented. Data on the reasons for default were obtained from the caregivers of the children after an informed consent. Ethical clearance was sought before the study was commenced.

Results/key findings: The major causes of patients defaulting their treatments were financial constraints 103 (73.6%), concurrent illness 75 (53.6%), unavailability of medicines 60 (42.9%), unavailability of staff due to strikes 32 (22.9%), seeking alternative treatments 31 (22.1%), forgetfulness 26 (18.6%) and transportation challenges 16 (11.4%).

Conclusion/recommendations: Financial constraints from caregivers, concurrent illness and unavailability of medicines were observed as the major causes of treatment default in paediatric cancer chemotherapy. A further study on these challenges will inform outcome improvement interventions.

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Clinical utility of the press through pack seal-type adherence support tool for locally advanced rectal cancer patients receiving capecitabine-based chemoradiotherapy

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Objective/purpose: Medication non-adherence is the major issue for cancer patients (pts) receiving chemotherapy. Pharmacists provide the leaflets which guide pts to increase medication adherence. In order to promote and monitor the adherence, we developed the press through pack (PTP) seal-type adherence support tool (PSAT) which pharmacists paste on PTP sheets, and potentially enable pts to put the seals on a medication calendar sheet when taking oral chemotherapy agents.

Study design/methods: We retrospectively reviewed clinical chart to evaluate clinical utility of the PSAT for pts with locally advanced rectal cancer receiving capecitabine (Cap)-based chemoradiotherapy (CRT). CRT was performed in a peri-operative setting, and Cap was concurrently given with 825 mg/m^2, five days-on, two days-off every week during RT of totally 45–50.4 Gy. Comparison of medication adherence difference of Cap for pts with the PSAT (PSAT group) and without (Non-PSAT group) was conducted. Statistics were done by Fisher's exact test. Adherence rate was defined as fully or not that a patient took Cap from electronic patient records.

Results/key findings: There were 20 and 19 pts in PSAT group (from August 2018 to March 2019) and non-PSAT group (from January 2017 to July 2018), respectively. Baseline characteristic of PSAT vs. Non-PSAT were follows: male, 75% vs. 84%: median age, 68 years both. Perfect adherence rate of Cap was 90% (18/20) in the PSAT group and 79% (15/19) in the non-PSAT group, respectively ($p = 0.6$). No adverse events were observed related to the PSAT.

Conclusion/recommendations: Medication adherence improved considerably after used PSAT. PSAT achieved medication adherence of 90% rate compared with non-PSAT, which increased approximately 10% pts receiving Cap-based CRT.

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Failure mode and effect analysis in IV chemotherapy ordering and preparation process during transition to the new robotic oncology unit

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Objective/purpose: As compliance to accreditation and internal quality monitoring requirements; the aim was to evaluate and improve IV chemotherapy ordering and preparation process during the transition to the new robotic oncology unit as a proactive risk minimization strategy.

Study design/methods: A hospital team of five experts from different disciplines (pharmacist, medical oncology practitioner, administrative coordinator, information technology) studied all organizational processes and created flowcharts to decide necessary actions to improve each step posing a risk before the transition. Afterward, the Failure Mode and Effect Analysis (FMEA) was prospectively applied to investigate the critical steps, risk levels and to suggest mitigation strategies in March 2017. Potential types, causes, and effects, as well as severity (S), the frequency of occurrence (O) and detectability (D) of

failures were specified. In order to decrease the risk priority number (RPN), new corrective and preventive measures were implemented such as adopting IV preparation robot for safety features like gravimetric control, barcode verification, and visual verification, building a clean room, applying latest guidelines and training the staff. Furthermore, crucial error preventive modifications were made on patient information management system software, such as entering chemotherapy protocols, adding dose calculators, revising minimum and maximum inventory levels for medications, software adjustments for choosing the right patient.

Results/key findings: Following the transition to the new oncology center, clean room, APOTECAchemo IV Robot, modified Avicenna patient information management system, the team continued with the FMEA and recalculated the RPN for each failure in January 2019. In the FMEA, the team detected 32 failure types. Prior to risk minimization interventions, total RPN for 32 failures was 4131 versus 1722 after the intervention (58.3% decrease). Minimum, maximum, mean and median of RPNs (27, 300, 129.1, 106) correlatively decreased after the interventions (16, 120, 53.8, 50) during the 22-month period. Statistically, the difference in means of RPN values was significant (t-test $t = 5.1921$, $p < 0.01$).

Conclusion/recommendations: Institutional multidisciplinary risk management approach enabled detecting possible failures, root causes, and preventive measures. Risk minimization strategies such as chemotherapy ordering improvements, software modifications, the transition to IV robotic preparation, and clean room resulted in significant improvement in RPNs.

Funding: Kent Hospital Oncology Centre.

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Chemotherapy-induced nausea and vomiting management in terms of compliance with National Comprehensive Cancer Network Guideline

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Objective/purpose: Chemotherapy-induced nausea and vomiting (CINV) is a serious adverse effect, which is distinguished in different degrees in chemo treatment which is according to the antineoplastic agent(s). This study is aimed to integrate the oncology pharmacist into the patient care especially into the appropriate evaluation of CINV. Owing to the fact that there is no local guideline related to this subject, National Comprehensive Cancer Network (NCCN) antiemesis guideline (Version 1.2019) was used as an up-to-date guideline. In this study, the compliance with (NCCN) antiemesis guideline was evaluated on those patients who were administered chemotherapy in our hospital settings.

Study design/methods: According to the NCCN guideline; premedication is defined as: (**A**=Neurokinin1 receptor antagonists + 5hydroxytryptamine receptor antagonists + Dexamethasone, **B** = Olanzapine + Palanosetron + Dexamethasone, **C**= Olanzapine + Neurokinin1 receptor antagonists + 5hydroxytryptamine receptor antagonists + Dexamethasone) and, for days 2, 3 and 4: (**A**=Aprepitant + Dexamethasone, **B**=Olanzapine, **C**=Olanzapine + Aprepitant + Dexamethasone).

UKONS toxicity assessment form is used (*ref. UKONS, Acute Oncology Initial Management Guidelines, February 2015*) when the patients are graded for nausea and vomiting when they come to their next cycle, the degree of nausea is stated as **1** in case of decreased appetite and **2** in case of decrease in oral intake; whereas the degree of vomiting is stated as **1** for patients who vomit 1–2 times in 24 h and **2** for patients who vomit 3–5 times in 24 h.

Between June 2018 and April 2019, 34 patients who were administered high emetogenic parenteral chemotherapy were retrospectively evaluated.

Results/key findings: Between June 2018 and April 2019, 34 patients (25 women, 9 men, median age 51.6 year old, the age range 28 year old–70 year old) who were administered high emetogenic parenteral chemotherapy including: Cisplatin $\geq 70\,mg/m^2$ (7 patients), Carboplatin AUC$\geq$4 (7 patients), Ifosfamide $\geq 2\,g/m^2$ (6 patients), AC (doxorubicin + cyclophosphamide) (14 patients) were retrospectively evaluated. The NCCN guideline compliance were measured into 146 chemo cycle including the prescribed premedication on the day of chemotherapeutic administration and the prescribed antiemetics on days 2,3 and 4 (discharge planning for some patients). In terms of premedication, the compliance of NCCN guideline is observed to be at 69.2%. (The compliance of premedication with A is 56.4%, and the compliance with C is 43.6%.) When considered the discharge plans or the medicines ordered on the days 2, 3, and 4 of

patients' admission, the compliance with the NCCN guideline is observed to be 61% (The compliance with A is 7.9% with B is 7.9% and with C is 84.3%.).

Additionally, the evaluation of the chemo treatment toxicity was evaluated into 119 cycles. The evaluation of the toxicity assessments is observed 42.9% of patients have first-degree nausea, 0.84% of second-degree nausea, 5% of first-degree vomiting and 0.84% of second-degree vomiting complaints.

Conclusion/recommendations: It is determined that our CINV management process is open to improvement considering the lack of patient education, the appropriate evaluation of toxicity assessments on the patient who were administered high emetogenic parenteral chemotherapy. During this study, we realized that the number of high emetogenic parenteral chemotherapy cycle and toxicity assessment forms were not correlated. We suggest that the presence of the oncology pharmacist will make a positive contribution to CINV management process including patient education and appropriate evaluation of the toxicity assessment.

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Patient-reported effectiveness and safety of NEPA for the prevention of chemotherapy-induced nausea and vomiting: Online service evaluation in the UK

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Objective/purpose: Chemotherapy-induced nausea and vomiting (CINV) remains a distressing side effect of chemotherapy which impairs patients' quality of life.[1,2] A service evaluation was conducted to report patient-reported effectiveness and satisfaction of NEPA (netupitant and palonosetron) in CINV prevention by UK chemotherapy patients.

Study design/methods: This service evaluation received approval from appropriate hospital managers at Kent and Canterbury Hospital and Southampton General Hospital. Eligible patients were ≥18 years, scheduled to receive cisplatin-highly emetogenic chemotherapy (HEC), anthracycline and cyclophosphamide/epirubicin and cyclophosphamide (AC/EC), or moderately emetogenic chemotherapy (MEC), and prescribed NEPA, as per the UK license. Patients used an online Web App to report nausea, vomiting, NEPA treatment satisfaction and adverse events daily for five days post-chemotherapy. Numerical rating scales were used to rate the degree of nausea (0–10) and number of vomiting episodes (0–10+). "No Significant Nausea" was defined as nausea rating <3. Adverse events were reported by patients in a free-text box. Patients' satisfaction with NEPA was rated on a seven-point Likert scale from "extremely dissatisfied" to "extremely satisfied". Data from diaries completed for Cycles 1, 2, and 3 are reported.

Results/key findings: A total of 39 patients were recruited (23 scheduled for cisplatin-HEC; 9 for AC/EC, and 7 for MEC) between 5 March 2018 and 11 February 2019. Of the recruited patients, 33 received oral NEPA and completed at least one cycle of scheduled chemotherapy. Diaries were completed by 24 patients after receiving their first chemotherapy cycle (Cycle 1), 14 patients after receiving Cycle 2, 7 after receiving Cycle 3, and 1 after receiving Cycle 4. A total of 238 dairy entries were recorded from a total of 62 chemotherapy cycles. Across the five days, most patients reported No Significant Nausea (≥80.0%) and No Emesis (≥97.0%). In Cycles 1 and 2, the proportions were highest during the delayed phase (Days 2–5; Cycle 1: No significant nausea >85%; No emesis >90%, Cycle 2: No significant nausea >90%; No emesis 100%). Nine (23.1%) patients reported at least one adverse event; most common were constipation (17 entries in 4 (10.2%) patients), acid reflux/heartburn/indigestion (13 entries in 3 (6.1%) patients), and bloating/wind (6 entries in 2 (5.1%) patients). Patient satisfaction with NEPA was high ("satisfied" and above) in terms of CINV prevention (44/46 responses), symptom relief (41/46 responses), ease and frequency of use (45/46 responses).

Conclusion/recommendations: These data confirm the effectiveness and acceptability of NEPA in preventing acute and delayed onset cisplatin-HEC, AC/EC, and MEC-associated CINV. Patient satisfaction with CINV control and usability of a single, oral dose of NEPA was high in chemotherapy patients in this service evaluation in the UK.

Funding: This service evaluation was funded by Chugai Pharmaceutical Co.

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Educational needs of oncology pharmacists: A survey report from the International Society of Oncology Pharmacy Practitioners (ISOPP)

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Objective/purpose: ISOPP is dedicated to providing educational resources to members for their continuous learning and professional development. This survey was conducted to explore the educational needs of ISOPP members for the purpose of developing resources to support future learning.

Study design/methods: A 17-question survey was distributed to ISOPP membership between 10 December 2018 and 15 January 2019 using an online survey tool. The primary aim of the questionnaire was to identify areas where ISOPP members would like more education, barriers to oncology pharmacy education access, and preferences for methods of educational delivery. Demographics of respondents and data relating to their practice settings were sought to help interpret results from a globally diverse membership. The survey was designed, reviewed, and finalized through a consensus approach by the ISOPP Education Committee. Questions relating to preferences for educational content and delivery employed a ranking scale for responses (1 to 5, with 5 being highest ranking). Responses were summarised using basic descriptive statistics.

Results/key findings: The survey was completed by 62/363 ISOPP members (17% response rate). The majority of respondents worked in inpatient cancer units (60%), ambulatory tertiary cancer centers (31%), and academia (26%). Reported barriers to accessing education relevant to oncology pharmacy practice included lack of financial support (44%), time spent travelling to attend educational activities (39%), limited learning opportunities in their country of practice (34%), and limited growth of the oncology pharmacy discipline in their country of practice (32%). The content areas of greatest demand included pharmacotherapy of various cancers followed by oncology pharmacy research, ISOPP oncology pharmacy practice standards, supportive care, and medication safety. Among recently updated ISOPP practice standards, respondents ranked oral chemotherapy as the most relevant topic, followed by safe handling of monoclonal antibodies, dose banding, computerised prescribed order entry, and investigational drugs. International or regional symposia were the preferred mechanisms for educational delivery, followed by webinars and master classes. Among respondents who identified webinars as an effective educational activity (87%), most preferred live webinars with the option to view recordings afterwards over webinars provided only as recordings. Reflecting the official language of ISOPP, most respondents (80 %) indicated English as the preferred language for education content delivery. The next most commonly requested languages were Spanish and Portuguese.

Conclusion/recommendations: This survey identified and prioritized the educational needs in a cohort of pharmacists practising in globally diverse settings with varied levels of national support for education and training. Results will direct the development and implementation of future educational activities of ISOPP to help advance global oncology pharmacy practice.

Funding: This survey was conducted by education committee of ISOPP, Canada.

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Inventory of Rituximab IV consumption in a private health institution of public interest since the introduction of its biosimilar medicinal product

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Objective/purpose: Rituximab is a genetically engineered chimeric monoclonal antibody. Its biosimilar has been referenced in our institution since February 2018.

The aim of the study is to analyse the Rituximab prescriptions seven months after the referencing of the biosimilar and to evaluate the economic benefits for the establishment.

Study design/methods: Between February and August 2018, the number of patients which had the

reference medicinal product and those which had the biosimilar medicinal product have been listed, using a software storage.

Using the prescription software, the rituximab indications and possible reasons prohibiting the switch to the biosimilar product have been added.

Results/key findings: During this period, 33 patients out of 64 had the biosimilar (51.6%). Concerning the 31 patients who had the reference medicinal product, no reason was found in their medical files about the fact they did not have the biosimilar medicinal product. Among them, six had rituximab for a non-oncology indication (19%). All patients with a non-oncology indication treatment had the reference medicinal product.

The ratio of patients on biosimilar to all patients increased from 12% in February to 78% in September 2018. The average gain (differential entitled to compensation medicine) with the introduction of biosimilar on this period was 5118 euros. With the introduction of the biosimilar, 10,174 euros would have saved during the study converting all patients to biosimilar, twice the realized gain.

Conclusion/recommendations: Despite an increased number of patients under biosimilar treatment, the goal of all the patients is not reached. However, biosimilar protocols for non-oncology indications were not already done during the study.

It was decided to the Drug and Sterile Medical Devices Committee in October 2018 to remove the referencing of rituximab IV and to validate all the protocols with the biosimilar. The full switch to the biosimilars of Trastuzumab IV and Infliximab was also validated during this committee. It will simplify the preparation and inventory management, and the economic gain for the establishment will increase. The French National Authority for Health (HAS) information on biosimilars will be posted in waiting rooms to better inform patients, in addition to the information given by the doctors during the medical consultation. A reflection was also initiated about limitation of the use of subcutaneous administration for some drugs having a biosimilar medicinal product.

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Introduction of an embedded NHS England high-cost medicines pharmacist at Oxford University Hospitals

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Objective/purpose: Over the last few decades, there has been a vast amount of research and subsequent innovation in the treatment of cancer. This is has led to substantial increases in patient survival as well as quality of life, with further benefits likely in the future. Unfortunately, this has also had a huge financial impact on healthcare systems, particularly publicly funded systems such as the NHS. As such, it is important that resources are converted into patient benefits as effectively as possible. To support this process, an NHS England (NHSE) embedded pharmacist was introduced to Oxford University Hospitals (OUH) to promote the management of high-cost cancer medicines.

Study design/methods: NHS England funded the post which is employed by OUH. OUH recruited a pharmacist to work within the Trust. The pharmacist, with a cancer background, was incorporated in the OUH's Medicines Effectiveness Team. The role was established as a liaison between the Medicines Effectiveness Team, the Cancer Pharmacy Team and NHS England. This role was recruited to in November 2018. In order to demonstrate the benefit of this role, savings or reimbursements of cancer high-cost drugs that this role contributed to were calculated.

Results/key findings: This role was established within the Medicines Effectiveness Team instead of being part of a clinical team. This placed the role centrally within OUH. This served to provide cancer expertise to the Medicines Effectiveness Team and disseminate medicines effectiveness expertise to the Cancer Team.

This has led to increased collaboration between these teams as well as with contracting and informatics teams. This has also strengthened connections with NHS England Specialist Commissioning. This collaboration has so far supported the recuperation of £220,000 from suppliers of OUH through auditing of reported activity and another £400,000 from facilitating biosimilar and generic switches.

Conclusion/recommendations: Providing funding for an embedded high-cost cancer medicines pharmacist

as enabled and supported substantial sayings to be made. This post has also provided essential experience and understanding of cancer treatments to the OUH Medicines Effectiveness Team, enabling greater focus on cancer therapy and effective use of medicines in this area. The post has also served as a hub for other teams such as informatics and contracting, who have used the expertise of this role to inform decisions and understand data they work with.

A limitation of the data that was collected is that it does not capture these more qualitative, less tangible benefit of this role. Work is ongoing to capture this benefit.

Funding: NHS England Southeast.

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Implementation of biosimilar trastuzumab at Oxford University Hospitals

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Objective/purpose: In 2018, biosimilar intravenous trastuzumab became available in the UK. Although clinically equivalent, biosimilar products are not molecularly identical to the originator and so consideration must be given when switching patients to ensure patients' safety. As these products offer an opportunity for cost saving and were included as part of the Best Value Products element of the Medicines Optimisation CQUIN (Commissioning for Quality and Innovation), Oxford University Hospitals (OUH) implemented a switch to a biosimilar product. This abstract describes the process that was used at OUH.

Study design/methods: Product choice was restricted to those approved for use by a regional tendering process. However, to achieve an efficient and safe switch, the process of implementing a product began before the tendering process was concluded. This started by comparing each biosimilar trastuzumab products that would be available at the time of implementation with Herceptin® to identify suitable products. Criteria included: licensed indications, reputation of the manufacturer, infusion time, observation times, literature used to license the product, and availability of extended stability data to support use within the day treatment unit.

Breast and upper gastrointestinal cancer consultants (prescribers of the trastuzumab) were consulted on the switch. This process included discussion of the possible issues with switching. Similar discussion was held with senior nurses. Education material was given to pharmacists and nurses to support the change. OUH's manufacturing contractor was also consulted on possible choices for product, to identify issues that may impact product choice and implementation deadlines (e.g. supply chain and stability of the product).

To inform patients of the switch, a patient information leaflet was produced. This leaflet was given to patients together with a verbal explanation from a nurse. This occurred at the infusion before the switch was implemented. Patients were referred to a doctor or pharmacist at the patient's request.

A proposal for the switch was discussed with the Drug and Therapeutics Committee and Oncology Governance Group to ensure agreement and understanding of the plan. This included product choice, method of switch (phased or wholesale switch), and consenting arrangements.

Results/key findings: Implementation occurred within two months of the tendering decision being announced, a month within the CQUIN target. The switch was accepted well by patients, as no complaints or requests were made to resume Herceptin® therapy.

Observation periods in the product literature were longer than locally agreed policy which was based on experience and audited practice. The longer observations times were initially used but local standards were reintroduced once 20 doses had been given. A subsequent audit showed that no infusion-related reactions were reported after reverting to local standards.

Conclusion/recommendations: The introduction of biosimilar products to replace originator products is a priority in the UK in order to optimise the opportunity cost of existing therapies. By co-ordinating with stakeholders and developing an understanding and awareness of the products available, OUH was able to introduce biosimilar trastuzumab in a manner that was safe, efficient and managed patient concerns.

Funding: Oxford University Hospitals NHS Foundation Trust.

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Nurse preparation of monoclonal antibodies (MABs) in clinical areas – Impact on capacity, wastage and patient experience at the University College London Hospitals (UCLH) Trust

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Objective/purpose: Monoclonal antibodies (MABs) are prepared in advance after clinical review in pharmacy aseptics to reduce patient waiting times and ensure safe administration. If the treatment is cancelled, the dose is wasted due to its short expiry. At the UCLH, nurses prepare specified MABs in clinical areas for example, rituximab. Following a review of aseptic capacity and patient waiting times, a risk assessment was completed for MABs considering safety and complexity for preparation. Nurse preparation of daratumumab and olaratumab was implemented in November 2018.

We aim to review the time taken for pharmacy dispensing of vials and nurse preparation compared to aseptic preparation; patient waiting times and drug wastage.

Study design/methods: Data were collected 12 weeks pre- and post-implementation from the electronic daycare diary and chemotherapy prescribing system Chemocare® for patient waiting times, doses and wastage. Times for aseptic preparation, dispensing and nurse preparation were conducted as snapshot audits. All prices were based on the BNF and include VAT.

Results/key findings: The average dose administered pre- and post-implementation was comparable, for daratumumab 1260 mg (range: 760–2460) requiring four vials per dose (range: 2–8), and for olaratumab 1120 mg (range: 650–1810) requiring three vials per dose (range: 2–5).

In pre-implementation, a total of 60 patients received daratumumab (30 patients, 154 appointments) and olaratumab (30 patients, 152 appointments). However, 10 doses (6%) of daratumumab and 2 doses (1%) of olaratumab were not administered, resulting in drug wastage of £52,160.00.

In post-implementation, a total of 47 patients received daratumumab (31 patients, 132 appointments) and olaratumab (16 patients, 84 appointments). However, 11 doses (8%) of daratumumab and 1 dose (1%) of olaratumab were not administered. There was no wastage with nurse preparation, and this equated to drug savings of £60,440.00.

The average aseptic preparation time pre-implementation was 120 min for daratumumab and 150 min for olaratumab. In post-implementation, the average pharmacy dispensing time was 25 min and nurse preparation time was 10 min.

The average patient waiting time was reduced from 40 min (range: 0–210) to 21 min (range: 0–86) for daratumumab and 80 min (range: 0–243) to 25 min (range: 0–154) for olaratumab.

Conclusion/recommendations: Patient waiting times were halved when nurses prepared daratumumab and olaratumab, this improved patient experience and enabled additional daycare capacity. Additional capacity was gained in the production unit, which could be utilised to take on additional workload. At UCLH, second-line daratumumab for myeloma was rapidly implemented in March 2019, as the increased activity primarily impacted daycare and patients that could be scheduled during under-utilised times, as aseptic manufacture was not required.

Following the withdrawal of Olaratumab, usage will decline over time. However, our daratumumab usage is expected to increase to an average of 14 appointments per week. Accounting for 6% of cancelled appointments, there is an annual drug wastage saving of approximately £200,000 with an average daratumumab drug dose cost of £4680 with nurse preparation.

Future work is to risk assess additional MABs for nurse preparation in clinical areas instead of aseptic pharmacy to increase capacity, reduce patient waiting times and drug wastage.

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Blinatumomab cassettes reduce the cost of treatment and facilitate outpatient administration

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Objective/purpose: Blinatumomab is administered as a continuous intravenous infusion for 28 days. For acute lymphoblastic leukaemia treatment, the dose is 9 μg/day for seven days, then 28 μg/day for 21 days for the first cycle; then 28 μg/day for 28 days for subsequent cycles up to a maximum of five cycles.

The manufacturer recommends infusions to be prepared in infusion bags or cassettes and the required dose administered over 24, 48, 72 or 96 h. Patients should be monitored for toxicity in hospital at the start of treatment with subsequent outpatient administration. At the UCLH, blinatumomab is prepared in cassettes, which are soft reservoirs filled with medication that is securely encased in an outer hard cassette and infused via an ambulatory pump. Medication cassettes are prepared by adding the exact volume of drug and diluent to the reservoir.

Medication administered via continuous intravenous infusion has implications for aseptic manufacture, safe administration, nursing workload and patient satisfaction. We aimed to analyse the cost of treatment using blinatumomab cassettes according to our local policy compared to the manufacturer's recommendation.

Study design/methods: At the UCLH, blinatumomab is prepared in cassettes containing 37.5 μg in 250 ml for doses at 9 μg/day and 116.5 μg in 250 ml for doses at 28 μg/day. Cassettes are changed every 72 or 96 h. Patients who received blinatumomab at the UCLH from October 2015 to April 2018 were reviewed, and the actual cost of treatment per cassette used was calculated and compared with the potential cost if prepared using the manufacturer's instructions. The length of inpatient stay was also noted. The cost of Blinatumomab 38.5 μg vial is based on the BNF price and includes VAT.

Results/key findings: Nineteen patients received a total of 29 cycles of blinatumomab, with an average of 1.5 cycles (range 1–3) per patient. A total of 231 cassettes were prepared, of which 56 (24%) were dosed at 9 μg/day. Blinatumomab cassettes were prepared with a total of 581 vials compared to 693 vials if prepared using the manufacturer's instructions. Blinatumomab cassettes using our method resulted in an overall drug cost saving of £225,904, which is an effective drug cost saving of 16%. Our manufacture method saves four vials per cycle.

Patients were in hospital for a total of 325 days, with an average of 17 days during cycle 1 and seven days for subsequent cycles. There was a 60% reduction in hospital bed days, as outpatient administration was facilitated.

Conclusion/recommendations: Preparing two set dose blinatumomab cassettes minimises the risk of incorrect aseptic. The cassettes have a fixed concentration and can be infused at a fixed rate, which allows safer administration, as the pump settings are not adjusted each time the cassette is changed.

Additionally, the risk of drug exposure is minimised in the event of a leak from the reservoir due to the outer hard cassette, making it safer for outpatient administration.

Blinatumomab cassettes facilitate safe administration in an outpatient setting, resulting in better utilisation of inpatient capacity and reduce the cost of treatment.

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A national point prevalence survey of SACT treatment delays

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Objective/purpose: Cancer centres supply thousands of doses of systemic anti-cancer therapy (SACT) each month, but a proportion of these doses will not be administered for various reasons, usually

resulting in a treatment delay. These delays affect the efficiency of outpatient services, pharmacy services and the patient experience. The aim of this project is to conduct a national point prevalence survey of treatment delays to generate benchmarking data to enable local service improvements.

Study design/methods: Nineteen cancer centres in the UK were sent a copy of the protocol and invited to participate. All NHS patients scheduled to receive SACT as an outpatient or day-case were included in data collection during a five-day working week in November 2018. Pharmacies usually prepare doses in advance for these patients, so appointment lists were generated 48–72 h before the date of the appointment, and any patients subsequently added to these lists were also included to capture late additions.

Results/key findings: Nine cancer centres participated in the survey. From 4389 patients scheduled to receive treatment at these cancer centres during the data collection period, 687 (15.7%) did not receive at least one of their prescribed treatments and therefore experienced a delay. The prevalence of treatment delays at each centre ranged from 6.9% to 21.5%. The majority (71.9%) of patients who experienced a delay were due to receive palliative treatment. The most common primary site of cancer for patients experiencing a delay was breast (19.4%), lower gastrointestinal (17.0%), lung (13.3%), gynaecological (9.5%) and upper gastrointestinal (9.3%). The most common reasons for treatment delays were: concurrent illness (27.2%), haematological side effects (18.6%), non-haematological side effects (17.0%), patient choice/error/did not attend (11.9%), process errors (11.6%) and disease progression (8.3%). The total chair time lost as a result of treatment delays was estimated to be 692 h. This was estimated using a list of chair times for each SACT regimen and may be an overestimate because it does not account for reuse of vacant time slots by late additions. Six centres were unable to include single-agent oral therapy in their data collection due to differences in the patient pathway at these centres.

Conclusion/recommendations: Each centre received a benchmarking report with data about treatment delays at their centre compared with other centres to encourage sharing good practice and enable local service improvement. There is concern that delays could have an impact on patient outcome, but there is little evidence to support this, and we found treatment intent was palliative for the majority of patients experiencing a delay. Data were not collected from patients who did not experience a delay, and doing so would have been useful to determine if observed differences could be explained by local variations such as primary site of cancer, but the increased level of data collection may not be realistic. The next stage of this project will be to facilitate the sharing of best practice between participating centres, before repeating the survey to monitor progress.

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Management of chemotherapy-induced hypersensitivity reactions among adult solid tumour patients at a tertiary cancer centre

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Objective/purpose: Variation in practice in the management of hypersensitivity reactions (HSRs) was identified between different clinical units and hospital sites at the Royal Marsden Hospital (RMH) Foundation Trust. This led to an audit of current practice against local guidelines to explore the differences across sites and identify areas for improvement.

Study design/methods: A retrospective audit of chemotherapy-induced HSRs in all adult patients treated on the RMH Medical Day Units between January and March 2018 was conducted. The audit focussed on grading and documentation of HSRs, re-challenge rates after initial HSR and use of desensitisation protocols for inpatient or outpatient administration. Paediatric, haematology and clinical trial patients were excluded.

Results/key findings: Reactions were graded in only 23% of patients and of these, 17% were graded incorrectly. Ninety two percent of patients with grade 2 reactions were not re-challenged as per guidelines. Desensitisation regimens were prescribed in 11% of cases and all were administered on an inpatient basis. Frequency of HSRs was significantly higher at one site within the Trust.

Conclusion/recommendations: Accurate grading of HSRs and re-challenge of patients are essential in the management of patients to inform future treatment. HSR management training of nurses, pharmacists and medical staff across the two sites will be crucial to improve compliance with guidelines and confidence in grading, managing and re-challenging

patients. A review of the desensitisation regimens is required to reduce the need for inpatient administration, resulting in subsequent cost savings and decreased service provision requirements. Updated guidelines should include the CTCAE v5.0 grading system for infusions reactions to allow for differentiation between different types of reactions.

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Exploring the feasibility of IGEV delivery through an ambulatory service

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Objective/purpose: The provision of chemotherapy through an ambulatory care (AC) model allows treatments traditionally delivered as an inpatient to be delivered outside of the hospital environment. The service aims to improve patient experience while accommodating increased demands on services within both adult haematology and teenage and young adult cancer services. Ifosfamide, gemcitabine and vinorelbine (IGEV) is used in relapsed/refractory Hodgkin's lymphoma and historically requires a five-day inpatient admission. The management of ifosfamide toxicities including: haemorrhagic cystitis, high instances of emesis and the rarer ifosfamide-induced encephalopathy were important considerations in transitioning this regimen to an ambulatory setting.

Study design/methods: Baseline data collection identified the demand for provision of IGEV through AC. The chemotherapy prescription was modified to fit an ambulatory model and was trialled in inpatients who were candidates for receiving subsequent cycles at home. Two litre bags of sodium chloride 0.9% were sourced to deliver a continuous infusion of mesna hydration via a smart pump and backpack system. Chemotherapy was delivered as standard infusions in the hospital. On the final day of ifosfamide, patients are prescribed oral mesna and required to drink 2 litres of fluid. Patients were taught how to monitor and record their fluid balance and perform urinalysis to monitor for haemorrhagic cystitis. A mesna algorithm was developed to support telephone triage and implement an immediate management plan following positive urinalysis results. Patients are provided with an emergency dose of oral mesna to allow interim management until arrival at hospital. Patients and carers were taught about the signs and symptoms of ifosfamide-induced encephalopathy. Standardised supportive care prescriptions were developed, and patients were counselled and provided with reminder cards to promote self-administration of medication.

Results/key findings: Five patients received IGEV using the modified ambulatory method. All patients had controlled symptoms throughout the treatment delivery period and did not experience adverse toxicities that would have required hospitalisation. All patients complied with the requirements of ifosfamide delivery in AC. As proof of principle, the pilot results indicate that IGEV could be safely transitioned to an AC setting. Modifications in delivery systems and medication delivery have cost implications. However, patients have positively fed back the benefits of receiving treatment this way. Feedback has included: improved independence and ownership, increased opportunity to engage in more normal activities and less intrusive delivery methods in comparison to traditional infusion methods. Education of patients and carers was fundamental to ensure safe delivery of care through this model.

Conclusion/recommendations: This ambulatory model for delivering IGEV chemotherapy has be demonstrated to be safe and operationally feasible. AC modification resulted in a one night reduction in treatment length. This will now be offered to patients from cycle 2 onwards who meet the eligibility criteria. As with all other AC regimens, patient and carer feedback will continue to be collected to consider the extent to which the primary outcome of improving patient experience is met and to consider the wider impactions on the carer supporting the patient at home. Subsequent work will assess the feasibility of transitioning other ifosfamide-based regimens to AC.

Funding: Macmillan funded role as Ambulatory Care Pharmacist.

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Audit of medicines reconciliation, interaction checks and interventions in cancer day therapy unit

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Objective/purpose: The Cancer Pharmacy Team at the Oxford University Hospitals (OUH) provide a clinical pharmacy service, patient counselling with medication record cards, near patient dispensing, medicines reconciliation (MR) and interaction check in the Day Treatment Units (DTUs).

The British Oncology Pharmacy Association's Medicines Optimisation, Safety and Clinical Pharmacy workforce plan[1] states that all patients should have an MR which is reflected in the OUH Cancer Pharmacy Team SOP.[2] The Specialist Pharmacy Service[3] states 'it is often necessary to use more than one source to confirm the medication history' which is reflected in the OUH Medicines Reconciliation Procedure.[4]

The aim was to assess the proportion of cycle 1 chemotherapy patients on the cancer DTUs who have had an MR and interaction check at day 1 of their cycle, and if any interventions were made as a result of this. The standard was that 100% of cycle 1, day 1 patients on the Cancer DTUs receive an MR.

Patients also have a drug history completed at screening before they come to the DTU from clinic letters and/or GP records. Data were collected about their accuracy compared to MR and interventions made.

Study design/methods: A report was run on the chemotherapy electronic system 'Aria' to make a list of all cycle 1 day 1 patients who received chemotherapy. A data collection form was created and piloted. The full audit was undertaken for all of April 2019 patients (163) from the Aria report. The data were analysed via excel pivot tables.

Results/key findings:

- Patients with MR completed: 81.6% (133/163)
- Interaction check at MR documented: 8% (11/133)
- Interaction check at MR unknown: 76% (101/133)
- Intervention as result of MR/screening drug history: 7% (11/163)
- Interventions documented to have been carried out: 73% (8/11)
- More than one source used for MR: 41% (54/133)
- Drug history at screening that matched the MR: 43% (35/82)

Conclusion/recommendations: The results show that the standard was not met. There were a large number of patients who did not have an MR completed and some who did not have a drug history assessment at screening either, meaning no interaction check could have been carried out. The small number of drug history's at screening that matched the MR highlights the need for MRs as potential interactions could be missed at screening.

All interaction checks, interactions found and interventions made should be recorded clearly in the MR form to avoid ambiguity, as this increases the workload of pharmacists if they have to double check.

Recommendations of improvement are as follows. To set up a prompt on the prescribing system reminding pharmacists/pharmacy technicians to do the MR and ask them which two sources were used. The MR should include sections such as 'interaction check completed', 'interactions found? And what action taken if 'yes' to reduce the amount of unknowns.

As result of this work, the DTU MR and screening templates on Aria have been updated to include the additional prompts. This audit will be repeated to assess any change in practice as a result.

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Interview-based service evaluation of the non-medical prescriber cancer care clinics at the Oxford University Hospitals NHS Foundation Trust

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Objective/purpose: Non-medical prescribing (NMP) improves patient care and access to medicines, and optimises health care professionals' skills, enabling flexible working within multi-disciplinary teams.[1] Studies about patient views and experiences of NMP have been undertaken.[2–6]

An increase in cancer prevalence and available treatments impacts on service providers, with new models of working being introduced to address capacity issues. The introduction of NMP at the Oxford University Hospitals NHS Foundation Trust (OUHFT) has enabled pharmacist and nurse-led clinics to address clinic capacity and improve patient access to medicines.

The aim of this research is to provide a service evaluation of the NMP cancer care clinics at the OUHFT with patient interviews.

Study design/methods: The project was approved by OUHFT Pharmacy Governance and the University Research Ethics Committee. It used qualitative research methods with semi-structured interviews of patients reviewed by an NMP at the cancer-care outpatient's clinic, as well as thematic analysis. Interviews were recorded and transcribed before analysis to find common themes and viewpoints from patients.

The interview schedule was based on a questionnaire piloted in the myeloma NMP clinic,[7] using open questions. Some questions were also based on the existing literature surrounding patient experiences of NMPs and the themes that had emerged from previous studies.

Results/key findings: In total, 10 interviews were carried out, 9 with male patients. Prostate cancer patients made up the majority of those interviewed, two patients had a haematological malignancy and one patient had kidney cancer. Nine of the participants gave consent to be recorded, and these interviews were transcribed verbatim, including all pauses and repetition. Notes were taken by the investigator throughout the last interview. Thematic analysis was performed on the transcripts in order to identify common points and themes that arose from the patient experiences at these non-medical prescriber clinics.

The emerging themes from this service evaluation were clinic efficiency, patient knowledge of NMP and consultation styles. All participants were very positive of the clinics and of the independent prescribers themselves. Many patients claimed to have experienced reduced waiting times compared to seeing a doctor and appreciated the longer, more relaxed style consultations offered by pharmacists and nurse prescribers. Some patients were not aware in their first encounter that they were seeing an NMP and others were unsure of the level of training they had received and would prefer to see a doctor if their condition worsened.

Based on the results of the thematic analysis, recommendations were made to improve patient satisfaction and experiences at NMP clinics at the OUHFT.

Conclusion/recommendations: Patients were very satisfied with the care they received and were all supportive of the NMPs. Recommendations to the clinic include offering telephone consultations to patients and ensuring patients are informed at the first opportunity that they are seeing an NMP along with a description of the training they have received. The results of this service evaluation can go towards filling the gap in literature surrounding patient experiences of NMP cancer care clinics.

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Cancer pharmacy team workforce reconfiguration

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Objective/purpose: The Cancer Pharmacy Team (CPT) at the Oxford University Hospitals (OUH) consists of 48.13 WTE staff including Pharmacists, Pharmacy Technicians and Assistants. The CPT provides the clinical pharmacy services to the Oncology & Haematology Directorate wards and day treatment units (DTUs), non-medical prescribing (NMP) support to clinics, oral education clinics (OEC), satellite pharmacy service, and pharmacy directorate workload. The cancer centre workload has increased by 10–12% annually due to the increase in chemotherapy delivery, the increased complexity of chemotherapy prescribed, increase in patient survival, increase in number of lines of treatment available to patients, as well as an increase in the number of drugs and regimens available for the treatment of cancer. The aim was to reconfigure the CPT structure due to the inability to recruit to band 7 pharmacist posts.

Study design/methods: The CPT structure was benchmarked against Cancer Centres of a similar size and workload nationally.[1] A case was made to reconfigure the CPT structure to include two advanced band 7 cancer pharmacy technicians and three band 8a advanced cancer pharmacists within the current budget. The reconfiguration proposal was approved by the Pharmacy Directorate Executive Board. 5.5 WTE band 7 vacant cancer pharmacist posts were converted to the 5 WTE new roles. Job descriptions and person specifications were developed, approved, and sent for Agenda for Change matching, in line with Trust procedures. Posts were advertised nationally and recruited to.

Results/key findings: Staff were appointed and commenced in the new roles in August (band 8a advanced cancer pharmacists) and October (band 7 advanced cancer pharmacy technicians). The reconfiguration has stabilised the team, and all posts within the team are now recruited to. The reconfiguration has enabled a career progression structure within the team. The staff appointed to the team were internal candidates.

Conclusion/recommendations: The reconfiguration is within the current financial budget of the team, reduces expenditure on agency staff and retains experienced staff reducing the training burden. Strategically this will support the growing cancer pharmacy service in line with service needs. The benefits of the restructure are in line with the Trust values.

Band 8a advanced pharmacists lead on specific disease sites, for example immunology/education and training, myeloid, lymphoma and myeloma.

The band 7 advanced pharmacy technicians undertake operational roles and take on some of the roles of band 7 cancer pharmacists, e.g. Oral Education clinic, new medicines and compassionate schemes implementation, ambulatory service support, datix investigations, and validation of repeat SACT prescriptions.

Funding: Oncology & Haematology Directorate, OUHFT.

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Prevalence of adverse events and factors affecting adverse events in chronic myelogenous leukemia patients receiving BCR-ABL tyrosine kinase inhibitors at the Siriraj Hospital

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Objective/purpose: Chronic myeloid leukemia (CML), currently being treated with drugs that are more specific to cancer cells, is the BCR-ABL tyrosine kinase inhibitors, including imatinib, nilotinib, and dasatinib. However, the drugs continue to have adverse effects from drug use, especially within the first year, which affects the selection of medicines for treatment.

Study design/methods: This retrospective study aims to determine the prevalence and risk factors that cause adverse events from using BCR-ABL tyrosine kinase inhibitors within one year after receiving the drugs. Results of a review of patient medical records at the Siriraj Hospital from 1 January 2007 to 31 December 2016 will be entered into a hospital database to plan, monitor and deal with the occurrence of adverse events that may occur with CML patients receiving this group of drugs. The study sample comprised 177 individuals who met the inclusion criteria.

Results/key findings: The results showed that the prevalence of the most common adverse events from receiving imatinib (n = 123) was thrombocytopenia (n = 53, 43%), nilotinib (n = 34) was neutropenia (n = 13; 38%), and dasatinib (n = 40) was thrombocytopenia (n = 19; 48%), respectively. Data analysis using logistic regression revealed that Blast phase contributed to the risk factors that caused neutropenia and was statistically significant in patients receiving imatinib and dasatinib (OR = 10.86, p = 0.036) and (OR = 7.67, p = 0.014), respectively. Thrombocytopenia was statistically significant found in patients receiving high doses of nilotinib (600–800 mg, OR = 1.17, p = 0.007).

Conclusion/recommendations: The prevalence of adverse events and factors affecting adverse events will enable to provide a more informed approach to the selection of therapy best suited to the individual needs of patients with CML.

Funding: Faculty of Pharmacy, Silpakorn University, Thailand.

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Evaluation of medicines reconciliation by non-pharmacy healthcare professionals to support pharmacy technician-led medicines optimisation for oncology outpatients

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Objective/purpose: Within Bristol Haematology and Oncology Centre consultants complete medicines reconciliation (MR) at the initial consultation where diagnosis, treatment options, and prognosis are discussed. However, MR standards published by the British Oncology Pharmacy Association and National Institute for Health and Care Excellence (NICE) recommend completion by an accredited pharmacy professional. Increasing emergence of polypharmacy and comorbidities within the cancer population increases the risk of drug interactions and impacts tolerability. In addition to the patient safety risk, failure to identify an accurate history until the day of treatment creates wastage from overprescribing, disposal of inappropriately supplied medications and missed opportunities to assess concordance and accommodate patient needs. While considerable research exists into the impact of pharmacy-led MR for inpatients and other specialties, literature on the outpatient oncology setting is lacking.

We sought to determine the quality of non-pharmacy-led outpatient MR against national standards.

Study design/methods: From December 2018 to April 2019, medical records of outpatients receiving Systemic Anti-Cancer Therapy (SACT) were sampled at random. The MR from their first appointment was retrospectively reviewed against audit standards from NICE Clinical Guideline 183 'Drug Allergy: Diagnosis and Management', and NICE Guideline 5 'Medicines Optimisation: The safe and effective use of medicines to enable the best possible outcomes'.

Results/key findings: Of 50 outpatients sampled (mean age 58 years; range 35–81), 28% of patients had no allergy status documented, and of the 12% with documented drug allergies, 16.7% met audit standards. The remaining 60% of outpatients were documented as having no known drug allergies. Drug history was included for 66% of patients, but none met audit standards for their documentation. Dose and indication were recorded in 6% and 4% of MRs, respectively. Administration route, form, and duration were omitted in every case. No MRs met the criteria for documentation of complementary medicines; 6% included a name only. Almost all patients (96%) had no documentation regarding over the counter (OTC) medications, with the remaining 4% documented as taking none.

Conclusion/recommendations: The quality of MRs completed by non-pharmacy healthcare professionals for outpatients commencing SACT is poor, with the majority failing to meet national recommendations.

To introduce pharmacy-led MR prior to commencement of SACT and evaluate the impact on medicines optimisation, patient safety and patient outcomes, BHOC have secured one whole time equivalent medicines management technician (AfC band 5) in partnership with Macmillan, to lead a 12-month pilot. This has optimised our workforce skills, will aide retention of skilled technicians and promotes pharmacy technicians to the rest of the UK via the Macmillan support network.

Funding: National Health Service.

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Safe handling of cytotoxic medicines in low- and middle-income countries – An overview of practices

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Objective/purpose: The rising burden of cancer has become a great concern in low- and middle-income countries (LMIC). As part of the global control strategies, strong efforts are made in order to improve access to chemotherapies. However, few studies had reported on handling practices of cytotoxic medicines in these settings.

Our objective was to obtain an overview of the level of practices that is implemented in healthcare facilities from LMIC dealing with cytotoxic medicines.

Study design/methods: An online survey was conducted from June 2018 to March 2019. The survey was disseminated through various professional associations, communities of practice and direct emails.

Participant facilities were asked to perform a self-assessment of their cytotoxic process using a self-assessment tool previously developed through a Delphi consensus method (Cyto-SAT). A scoring system from 1 (no activity) to 4 (fully implemented) was used to assess practices and process regarding 134 items organized in 10 domains. Data were recorded on an online platform (www.datapharma.ch/cyto-SAT).

Results/key findings: Forty-eight healthcare facilities from 32 countries completed the survey; 13 (27%) were from upper-middle income, 18 (38%) from lower-middle income and 17 (35%) from low-income countries. The median level of safe practices implementation was 73% (Q1: 49; Q3: 83). Facilities from low-income countries reported a lower level of safe practices implementation compared to middle-income countries (LIC: 46% (Q1: 38; Q3: 66), lower MIC: 73% (Q1: 68; Q:3 79), Upper MIC: 86% (Q1: 81; Q:3 92)) with the highest differences related to the personnel, preparation and incident management domains. The five highest scored items were related to prescription (2), management (2) and personnel (1) for which 63% to 83% of participant facilities scored 4. The five lowest scored items were related to cleaning (2), management (2), and personnel (1), for which 45% to 55% of participant facilities scored 1 (no activity).

Finally, participants mentioned that training, mentoring and collaboration between institutions would be of great benefit to support them in improving their practices.

Conclusion/recommendations: This survey provides an overview of cytotoxic handling practices in a wide variety of settings.

It emphasizes strengths and weaknesses in the cytotoxic process and identified training needs. Although the median percentage of safe practices implementation level was quite high, results varied markedly between low-income and upper middle-income facilities, with a difference of more than 50% for some domains.

To pursue our work on safe handling of cytotoxic medicines in LMIC, an impact assessment of a blended-learning module is planned.

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Capacity release and associated efficiencies through ward level preparation of selected monoclonal antibodies

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Objective/purpose: Demand for monoclonal antibodies as part of systemic anticancer therapy (SACT) has been rising continuously for several years. The majority of these doses are prepared within the Pharmacy Chemotherapy Unit and St Bartholomew's hospital. Limitations in capacity mean that novel means of delivering monoclonal antibodies are required. Aseptic preparation of these doses in advance also has an element of waste which can also be addressed through a review of this process. The vials would be supplied directly to the wards via the existing infrastructure set up for supply of readymade doses.

The aim if this project was to identify agents suitable for ward level preparation using an appropriate closed system transfer device (CSTD) using a risk assessment tool and to implement this new process quantifying any capacity released and potential financial savings.

Study design/methods: Potential drugs were initially identified selecting those with flat dosing schedules, which were already in solution and with high risk of wastage based on current local data. These were then further risk assessed using a combination of health and safety assessment and the NPSA drug preparation tool. This approach is outlined in the article by Langford et al. This approach identified three drugs that would be used as a pilot to demonstrate proof of concept.

Results/key findings: Pertuzumab, obinutuzumab and atezolizumab were assessed as low–moderate using the above methodology with the following results:

Pertuzumab – **Low moderate** (H&S moderate and NPSA green)
Obinutuzumab – **Low moderate** (H&S moderate and NPSA green)
Atezolizumab – **Low moderate** (H&S moderate and NPSA green)

Based on an annual usage of approximately 1110 doses per annum and the cumulative wastage reports, the following benefits were predicted:

- £152,098 per annum saved from wasted drugs
- 1100 doses per annum removed from production unit ~16 production days based on current capacity
- cBenefits in turnaround time for supplying these drugs

Conclusion/recommendations: Supply of SACT for preparation at ward level using a risk-based approach and with appropriate training and equipment is a potential way to release manufacturing capacity, reduce drug wastage and improve patient experience.

We plan to monitor the savings over the next 12 months as well as any safety concerns identified. Should this prove to be successful we will look to expand to additional drugs in 2020/2021.

Manufacturing capacity within NHS organisations is, and will continue to be an issue as demand for their services continue to rise. We need to consider novel ways to deliver treatments in an efficient manner whilst also considering the safety of the staff handling these potentially toxic drugs.

Reference

1. Langford S, et al. Assessing the risk of handling monoclonal antibodies. *Hospital Pharm* 2008; 15: 60–64.

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Drug sterility is maintained in Luer Lock (LL) syringes fitted with Tevadaptor syringe adaptor lock (SAL) according to NHS yellow cover document syringe integrity standards

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Objective/purpose: Disposable syringes are regularly used as final containers for aseptic products prepared within hospital units and compounding centres. The use of closed system transfer devices (CSTDs) can prevent exposure to cytotoxic drugs whilst maintaining drug sterility. In this study the Syringe Integrity of a closed system (Tevadaptor SAL) was tested in combination with a range of Luer Lock syringe sizes reflecting clinical practice according to the 2013 NHS yellow cover document (YCD) guidelines.

Study design/methods: Tevadaptor (Simplivia Healthcare Ltd) SAL were tested in combination with Luer Lock syringes at: 1 mL, 20 mL and 60 mL. Twenty syringes at each volume size fitted with SAL were filled with TSB growth media. The SAL septa were punctured during the TSB draw up from a vial as would happen in clinical practice. The devices were immersed in a vessel containing TSB inoculated with a 24 h culture of *Brevundimonas diminuta* in a ratio 100:1 mL (single strength TSB media:culture) sufficient to cover the SAL to LL syringe hub (partial immersion test), incubated for 14 days at 30–35°C followed by visual examination of the container system for evidence of microbiological growth. Physical integrity was tested using device combinations at each syringe size (n = 20), filled with MilliQ water, submerged in a vessel containing 0.4% w/v methylene blue (MB), sealed and rotated at 45 r/min for 2 h. The devices were then cleaned and inspected with absorbances measured at 660 nm.

Results/key findings: All Tevadaptor SAL/syringe combinations showed no evidence of microbiological growth, demonstrating that sterility was maintained. Positive control tests (n = 2) produced growth following inoculation with <100 cfu of *B. diminuta* and incubation for three days at 30–35°C.

Physical integrity: Limit of detection (LOD) for the MB dye was determined at 1:10,000 dilution of 0.4% w/v stock for both visual and instrumental readout. Combinations of Tevadaptor SAL + LL syringe (n = 20) at the three syringe sizes tested were found to be below the LOD, indicating no ingress of MB dye at the end of test. Positive control tests (n = 3) at each size showed ingress of dye with absorbances ≥0.010 (±0.005) mAu confirmed spectrophotometrically and by visual appearance.

Conclusion/recommendations: Tevadaptor SAL is the first closed system transfer device (CSTD) to be tested in combination with Luer Lock syringes as a final container system for cytotoxic drugs and passes the acceptance criteria of the 2013 NHS QA YCD for syringe integrity testing by both physical and microbiological methods. A stringent microbiological challenge was applied in the study using the motile organism *B. diminuta* with an extended contact time of 14 days incubation at 30–35°C. The puncture of the closed system device septa prior to testing provided a potential route of access for ingress. All devices passed both the physical dye intrusion (n = 60) and microbiological (n = 60) challenges after first puncture of the septa. Tevadaptor SAL is the first CSTD to be tested in accordance with the 2013 NHS YCD syringe integrity standards second edition.

Funding: Funding was provided by a research grant from Teva Medical including donation of the Tevadaptor syringe adaptor lock (SAL) medical devices.

Reference

1. NHS Pharmaceutical Quality Assurance Committee. Protocols for the integrity testing of syringes. Yellow cover document (YCD) 2nd edition 2013.

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Tackling antimicrobial resistance (AMR) in cancer patients at The Christie NHS Foundation Trust

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Objective/purpose: On 24 January 2019, the UK government published a five-year national action plan for 'Tackling AMR', which is part of the UK's AMR 20 year vision where 'optimal use of antimicrobials and good stewardship across all healthcare sectors' is a vital component. Many situations in healthcare require effective use of antimicrobials, e.g. when used in cancer patients receiving chemotherapy. At The Christie, a monthly point prevalence audit (PPA) was initiated in April 2018 as part of the antimicrobial stewardship strategy. The audit results suggest that from April 2018 the trust is not consistently meeting the 90% target for the audit standards, most importantly the 'Percentage of treatment in line with trust guidelines (i.e. appropriateness of agent)' standard. A microbiologist and pharmacist-led antimicrobial ward round was therefore initiated. This project will aim to tackle the objectives highlighted in the AMR five-year plan (1: reducing need for, and unintentional exposure to, antimicrobials, 2: optimising use of antimicrobials, 3: reducing UK antimicrobial use in humans by 15% by 2024) and aim to improve the percentage of compliance to the PPA standards in our high-risk cancer patient population.

Study design/methods: In January 2019, a ward round (WR) framework was developed (and validated by the infection prevention and control team (IPCT)) which allowed measurement of specific outcomes post WR. The IPCT initially decided that the inclusion criteria for the weekly WR were all oncology in-patients on meropenem or piperacillin/tazobactam, to assess inappropriate use of broad spectrum antibiotics as discussed in the AMR five-year plan. Between 20 February 2019 and 1 May 2019, all in-patients meeting the inclusion criteria were identified by the pharmacy technicians the day prior to the weekly WR. The specific patients were then discussed within the WR MDT (consisting of microbiologist, pharmacist, ward doctor and ward nurse), and outcomes of the antimicrobial clinical discussion were documented and categorised into four different areas – oral step down, continue

current regimen, stop antibiotics and optimise antimicrobial regimen.

Results/key findings: Between 20 February 2019 and 1 May 2019, 62 meropenem and piperacillin/tazobactam prescriptions were assessed on the weekly WR. The results show that 12 patients (19.4%) had their antibiotics stepped down to an appropriate oral agent, 6 patients (9.7%) had all of their antibiotics stopped, 8 patients (12.9%) had their current antimicrobial regimen optimised and 36 patients (58.1%) continued their current antimicrobial regimen. Overall, inappropriate antimicrobial use (classified as inappropriate at the point of intervention) was reduced by 41.9%. The PPA audit standard: 'Percentage of treatment in line with trust guidelines (i.e. appropriateness of agent)' increased from 88% in January 2019 to 94% in April 2019.

Conclusion/recommendations: The outcomes from the WR were fed back to the whole of the IPCT, which highlighted the benefit of consistent microbiologist and pharmacist input to the management of infections in cancer patients at The Christie. Additional projects are underway (including the use of smartphone apps) to further improve the compliance: with the PPA standards and the AMR five-year plan, but most importantly to improve our patient outcomes.

Funding: N/A – NHS Audit via The Christie NHS Foundation Trust.

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Influence of price policy on accessibility of pemetrexed in lung cancer patients

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Objective/purpose: The price of pemetrexed reduced several times since pemetrexed listed in the health care insurance in different provinces in China. We aimed to find out its influence on the accessibility and the influence on prognosis.

Study design/methods: This is a retrospective study in the real-world setting. Between 2012 (first time pemetrexed has been introduced in our center) and 2018, patients were included in this study who received pemetrexed in Fudan University Shanghai Cancer Center (FUSCC). Generally, ages, sex, geographical distribution, the cost of drugs in each chemotherapy cycle, the number of cycles completed were collected from our hospital information system. The number of cycles completed was used to estimate drug accessibility.

Results/key findings: A total of 2901 lung cancer patients were collected who received pemetrexed as adjuvant chemotherapy after the surgery or systemic chemotherapy in advanced stages. There are 1500 males (52%) and 1401 females (48%) included in the current study with mean age 58 y/o (age range 18–86 y/o). More than 90% of the patients were from other provinces in China. During 2012 to 2018, the median cost of a single cycle has reduced from RMB 11,280 to RMB 6871 (↓39.1%). Conversely, the median number of cycles completed has been increased from 1 to 4 (↑400%).

Conclusion/recommendations: As the price is dropping, more chemotherapy cycles were completed. And the group purchase policy executed in 2019 cutting down the price of pemetrexed to an even lower level will be another boost to the drug accessibility. However, other factors like income growth, the survival or health-care benefits may also influence drug accessibility which should be closely monitored.

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An exploration of the roles of non-medical prescribers in oncology: Pharmacist focus

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Objective/purpose: Non-medical prescribers (NMPs) are an important resource in the NHS, and numbers are currently increasing. There is research to show that NMPs of all professions are practising in a number of therapeutic areas in both primary and secondary care. Little is known about the roles and scope of practice of the NMP role, particularly in oncology. This research, which focuses on NMPs from the pharmacy profession, is part of a larger project looking at the scope of practice, expectations and opinions of NMPs from pharmacy, nursing and radiography. It aims to establish whether NMPs have extended their traditional roles and how integrated they are into the teams they work with.

Study design/methods: Pharmacists who had been qualified as NMPs for a minimum of six months were interviewed regarding their scope of practice, expectations of the role and opinions of NMP practice. Interviews were 20–30 min long and face to face.

Results/key findings: Four pharmacists were interviewed as part of this research. They all described largely similar prescribing activities covering a range of medicines including systemic anti-cancer therapy, supportive medicines and controlled drugs in an outpatient setting. Only one took part in clinical trial prescribing. Two pharmacists described conducting face to face patient consultations in conjunction with these prescribing activities. Inpatient prescribing was only undertaken on an ad hoc basis by two participants. None of the participants clinically examined patients in their practice.

When questioned about non-patient facing activities, all pharmacist participants described being involved in writing treatment protocols and guidance, audit, service evaluation and education and training.

Limitations to practice including not being able to prescribe blood products or order radiological investigations were not seen to be a barrier to practice. The main barrier to extending practice was a lack of time; this was linked to complex job roles meaning they could not devote time to their prescribing role. This was seen as a barrier to integration.

Conclusion/recommendations: The pharmacists in this study have extended their roles using their prescribing qualification. Some of the skills obtained in training to be a pharmacist and a prescriber are under utilised, for example consultation skills. However, practicing at a disease-specific level allows pharmacists to aid others in safe prescribing and administration of treatment through non-patient facing activities such as protocol writing and education.

Structured training and support could further extend the practice of pharmacist NMPs in the Trust. Further research is needed into the best way to utilise the skill set of pharmacist NMPs in the Trust and achieve better integration into clinical teams.

Funding: Part funded by The Christie NHS Foundation Trust in support of an MSc qualification with The University of Manchester.

Translational/Basic Science (TS)

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An evaluation of genetic markers for cardiotoxicity following doxorubicin chemotherapy

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Objective/purpose: Cardiotoxicity is one of the more severe toxicities observed after cancer treatment. It is currently diagnosed by echocardiography after cardiotoxicity is established. There are several serological biomarkers that are again used for diagnosis, but no marker exists for risk profiling. Since there are a lot of genetic association studies with cancer-related cardiotoxicity, we aimed to review the genetic data and gain insight into the mechanism of cardiotoxicity.

Study design/methods: We screened the medical literature and NHGRI-EBI genome-wide association study (GWAS) catalogue to collect the genetic markers ($n = 24$) for further analyses.

Results/key findings: Those variants were not concentrated in any genomic region. When we checked associations of these variants with traits other than cardiotoxicity, the most significant one was with bilirubin serum levels. As the most common mechanism of genetic associations, the correlations between these variants and gene expressions (eQTL effects) were explored using PhenoScanner v2. Those 24 variants showed eQTL effects on 155 genes in various tissues including cardiovascular system. Of the 18 genes (over 10 chromosomes) with eQTL effects in the heart, six (TMEM176A; TMEM176B; CAT; SULT2B1; ABCC1; BCL2L2) belonged to the gene set down-regulated in ME-A breast cancer cells undergoing apoptosis in response to doxorubicin in mice ($FDR = 0.028$) in GSEA/MSigDB analysis. Pathway analysis on ENRICHR identified three pathways from Reactome database for gene set enrichment (adjusted $P < 0.01$): detoxification of reactive oxygen species; biological oxidations; ABC-family proteins mediated transport (all in humans).

Conclusion/recommendations: This preliminary in silico analysis of cardiotoxicity-associated genetic markers has highlighted several leads to follow in experimental verification studies to unravel the mechanism of doxorubicin-induced cardiotoxicity.

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Pharmacological study of monitoring the blood glucose levels by pioglitazone drug to decrease the progress of carcinogenesis in skin cancer rats

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Objective/purpose: Hyperglycemia, the most significant characteristic of diabetes, may be liable for surplus glucose supply to these glucose-hungry cells and contribute to resistance to apoptosis, oncogenesis, and tumor cell resistance to chemotherapy. The present study was designed to investigate how to identify the decrease in the progress of cancer by controlling blood glucose levels using pioglitazone in models of skin cancer in rats.

Study design/methods: Twenty male rats were receiving 0.2 ml of 7,12-dimethylbenz (a) anthracene 1% (DMBA) with ultraviolet B radiation (UVR-B) for induction of skin cancer. The number of rats carrying at least one tumor expressed as a percentage incidence. Tumor burden was obtained by dividing the total number of tumors with the number of tumor-bearing rat in a group. The volume of the tumor was assessed by multiplying the length, width, and height of the tumor to x/6. Pioglitazone was administered at a dose of 10 mg/kg IP one time daily for five weeks in normal rats and rats exposed to DMBA/UV. Alkaline single-cell gel electrophoresis was performed. The plasma was separated from blood using centrifugation and the cells were diluted 20-fold for the comet assay. The comet assay was used to evaluate the influence of the pioglitazone on DNA damage and on the initiation of skin carcinogenesis, respectively.

Results/key findings: DMBA/UV-treated control group showed 100% tumor incidence, and the tumor was histopathologically confirmed. Pioglitazone treatment caused a significant reduction in tumor incidence, tumor yield, and tumor burden by 53.04 %, as compared to the DMBA/UV-treated control group. Diabetic rats treated with DMBA/UV showed a significantly higher level of tumor burden as compared to rats exposed only to DMBA/UV. Pioglitazone seemed to have little effect on reversing established tumors or initiated tumor cells, but it significantly prevented further tumor development of established tumors or initiated tumor cells. Furthermore, The DNA damage was measured as percent tail DNA significantly decreased in pioglitazone treated rats by 62.5% as compared to DMBA/UV control group.

Conclusion/recommendations: Pioglitazone enhances decreasing in BGL, hence showing its role in detoxification pathway. Both of carcinogenesis and DNA damage activities suggest that environment effects that lead to skin tumor can be controlled by the administration of pioglitazone. The results suggest that pioglitazone may exert a chemopreventive effect on DMBA/UV-induced skin cancer in rats by decreasing blood glucose level.

Funding: Pharmacy program, Batterjee medical college for science and technology, Jeddah, KSA.

Trainee (TR)

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Knowledge, awareness and believes about cancer misconceptions in Saudi Arabia: An observational cross-sectional study

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Objective/purpose: The aim of this study is to assess the public knowledge and believes about the most common misconceptions regarding cancer in Saudi Arabia in order to provide a suitable way to correct and educate the public regarding cancer facts. Which in turn, will aid health care providers to educate the public and cancer patients on the disease.

Study design/methods: An observational cross-sectional study was conducted in 5366 residents in Saudi Arabia through distributing a survey through social media outlets and in hard copies in public places, the survey was distributed for 11 weeks starting from September to December in Saudi residents who are older than 16 years and never been diagnosed or have a history of cancer.

In order to identify the cancer misconceptions, we have calculated the percentage knowledge score (KS) for each section, then we calculated the total percentage of KS by composing general information KS, risk factors KS, warning signs KS and treatment KS.

The correct answer was scored one, while the wrong answer and don't know answers were scored zero.

We excluded participants score if they did not answer the whole section questions.

Results/key findings: Most of the participants were females 3816 (73.6%) and 1372 (26.4%) were males. The mean age of the participants was 29.94 (±SD 11.087) years with a range of 18 to 85 years. A total of 4983 (96%) of the participants were Saudis and 3577 (68.9%) of them live in the central region of Saudi Arabia, whereas 255 (4.9%) of the participants live in the Eastern region of Saudi Arabia.

A total of 3155 (60.8%) of the participants have a bachelor's degree and above. Also, 4251 (81.9%) of the participants are not health care providers; moreover, they did not have any health science education.

The mean total knowledge score was 58.65% (±15.15), the minimum score was 2.86% and the maximum was 94.29%. Analysis with independent t samples test and one-way ANOVA show that there is statistically significant difference in the total knowledge score across gender (95% CI 5.4–7.4, $p = 0.000$), age group (95% CI 58.22–59.0, $p = 0.000$) and education (95% CI 58.22–59.1, $p = 0.000$), with females being more aware than males, and younger participants have higher KS.

Around 88% believed that cancer cannot spread from one person to another, and about 89.4% believed that cancer can be cured if detected early. 55.2% of the participants believed that it is difficult to detect cancer early.

66.8% believed that they will not get cancer if one of their relatives was diagnosed with cancer. While 39.6% believed that cancer might be an inherited disease.

Conclusion/recommendations: This survey indicated the need for more educational programs about cancer in Saudi Arabia. Greater efforts should be made to increase public knowledge about cancer. Moreover, the results of this study have provided an updated data on cancer public knowledge, myths and misconceptions that will be beneficial and crucial for future studies in Saudi Arabia in order to provide a suitable way to correct and educate the public regarding cancer facts.

Funding: The authors of this presentation have nothing to disclose concerning the possible financial or personal relationship with commercial entities that may have a direct or indirect interest in the subject matter of this presentation.

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Economic impact of a capping strategy of nivolumab and pembrolizumab versus fixed-dose

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Objective/purpose: Nivolumab and pembrolizumab dosage have changed from weight-dose initially (3 mg/kg each two weeks (Q2W) and 2 mg/kg each three weeks (Q3W), respectively) to fixed-dose (240 mg and 200 mg, respectively) more recently in the main diagnoses. The aim of this study is to analyse the potential economic impact in three different scenarios: (a) prescribed dose (weight-dose for nivolumab and weight or fixed-dose for pembrolizumab); (b) weight dose with capping (maximum dose = the fixed-dose); (c) fixed-dose.

Study design/methods: Observational retrospective study of doses prescribed from January 2017 and August 2018 (nivolumab) and October 2017 to February 2019 (pembrolizumab). *Setting*: tertiary general university hospital. All patients with at least one dose administered were included. Partially used vials are re-used per practice, and total re-use is assumed. *Variables recorded*: diagnosis, age, gender, real weight, prescribed doses, theoretical dose with capping (nivolumab: 3 mg/kg with maximum dose: 240 mg; pembrolizumab: 2 mg/kg with maximum dose: 200 mg), and fixed-dose, cost were calculated using actual prices. All data were obtained from pharmacy record from Farmis-Oncopharm™. The statistical analysis was carried using Excel™, mean and percentages data with their confidence intervals are presented (95% CI).

Results/key findings: Sixty-five patients received nivolumab group, median age 61 years (95%CI: 57–64) and a mean weight of 71.7 kg ($n = 47$, <80 kg; 72.3%) (95%CI: 68.4–75.0). Diagnoses were: metastatic renal carcinoma ($n = 25$); metastatic melanoma ($n = 9$); non-small-cell lung cancer (NSCLC) ($n = 25$); hepatocarcinoma ($n = 4$); Hodgkin lymphoma ($n = 4$); others ($n = 5$).

Thirty-seven patients received pembrolizumab; median age 64 years (95%CI: 61–68) and a mean weight of 74.1 kg ($n = 36$, <100 kg; 97.3%) (95%CI: 70.5–77.8). Diagnoses were: NSCLC ($n = 28$); metastatic melanoma ($n = 5$); colorectal ($n = 3$); bladder cancer ($n = 1$).

During the study period, 179,400 mg of nivolumab were used with a cost of 1,504,914€. Using the capping dose, the estimated cost was 1,445,523€ and fixed-doses 1,659,091€.

Pembrolizumab (46,870 mg) was used with a cost of 905,528€. Using weight-dose with capping dose, the estimated cost was 763,333€ (39,510 mg) and with fixed-doses 1,004,640€ (52,000 mg).

The cost difference between the nivolumab capping strategy vs. fixed-dose represents 24,1307€ (128,655€ per year), corresponding to nivolumab 25,444 mg during the study period, and 115 infusions considering a mean weight of 71.7 kg (mean dose: 215 mg Q3W).

The cost difference between the pembrolizumab capping strategy vs. fixed-dose represents 213,568€ (170,334€ per year), corresponding to pembrolizumab 24,980 mg during the study period, and 169 infusions considering a mean weight of 74.1 kg (mean dose:148 mg Q2W).

Conclusion/recommendations: 72.3% of patients (<80 kg) would have received superior doses if fixed-dosed, with a 15% of overdose with nivolumab. With pembrolizumab, 97.3% of patients (<100 kg) would have received superior doses if fixed-dosed, with a 24% of overdose. With the expected increases in the use of these antineoplastics, the implementation of the capping strategy, equally effective and safe, has emerged as a cost-effective intervention and would have an important impact on savings (15% with nivolumab and 24% with pembrolizumab) to the public health system.

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When is it acceptable to allow a terminal patient to die? A cross-sectional study with UK pharmacy students

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Objective/purpose: Accompanied suicide is a controversial topic with varying practice across Europe. In the UK, accompanied suicide is illegal; however, various charities and organisations have been lobbying for its legalisation. There is very little guidance on what healthcare professionals should be educated and trained regarding this topic. Moreover, leading organisations across Europe and the UK use different terminologies and definitions. This adds to the complexity of this topic and the reduced awareness of healthcare professionals. This study implemented an anonymous, cross-sectional online survey to discover the perceptions of final year MPharm students on accompanied suicide and the factors affecting one's views, with the aim of investigating the knowledge, awareness and opinions of pharmacy students regarding accompanied suicide. Factors measured included both patient factors, such as age and illness and participant factors, such as gender and religion.

Study design/methods: Surveys were disseminated via email and social media to final year pharmacy students at Kingston University (KU) between January and March 2019. The survey comprised of three sections: Section A, consisting of definitions – to determine how educated pharmacy students are on accompanied suicide. Section B, including case studies – to understand the opinions of pharmacy students on accompanied suicide, and identify patient factors that could influence their views. Section C, involving demographics – to discover the participant factors that affect their opinions on accompanied suicide. An ethics application was submitted and approved prior to conducting this study.

Results/key findings: The data collected yielded a total of 111 responses out of a possible 139 (80% response rate). 77.5% participants were unable to correctly define each term given, with many also agreeing their lack of knowledge affected their views. Overall, most pharmacy students disagreed with accompanied suicide, regardless of the patient factors; however, results found the disease of the patient influenced participants' views and they were less likely to agree with accompanied suicide if it involved a child. Additionally, religious participants were more likely to disagree with the patient request ($p < 0.03$).

Conclusion/recommendations: Three recommendations were concluded to improve the education of pharmacy students: (1) An approved medical organisation to specifically define each term and avoid any confusion with terminology, (2) include accompanied suicide in the pharmacy syllabus and (3) include lesser known terminal illnesses on the pharmacy syllabus. Furthermore, awareness and conversations on accompanied suicide could aid in understanding participants' conflicting views; however, further studies in other universities should be conducted to confirm these findings.

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Clinical pharmacy services in an ambulatory oncology clinic: Patient perception and satisfaction

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Objective/purpose: There is limited available evidence evaluating patient perception and satisfaction of clinical pharmacy services provided in an ambulatory oncology clinic; therefore, the primary objective of this study was to evaluate which clinical pharmacy services are perceived to be important to patients. Secondary objectives included a comparison of patients' perceptions before starting treatment to after receiving care, as well as, evaluation of patients' level of satisfaction with these services.

Study design/methods: Prospective, mixed method, single-centre study involving surveys and patient interviews over a three-month period from December 2018 to March 2019. Eligible participants included individuals (19 years of age and older) who were new patients to The Moncton Hospital's ambulatory oncology clinic starting either parenteral or oral cancer therapy for the first time. Consenting participants completed a survey at their first visit, evaluating their perceptions of the importance of clinical pharmacy services offered in the ambulatory oncology clinic. They completed a second survey six to eight weeks later to re-evaluate their perceptions and to measure satisfaction ratings. Survey responses were used to quantitively analyze patients' responses. The final component of this study involved semi-structured one-on-one telephone interviews to gather qualitative data related to the study objectives.

Results/key findings: A total of 35 participants were included in the study. Eleven of which were contacted to complete one-on-one patient telephone interviews. Overall, patients perceived the clinical pharmacy services assessed as important to their care before receiving treatment. On the second survey, 82.9% of patients recalled speaking to a pharmacist in the oncology clinic since they began treatment. Two services resulted in a significant change of importance between the two surveys. Firstly, the ratings of the importance of the pharmacist in managing patient's nausea/vomiting significantly decreased when remeasured [$t(28) = 3.04$, $p = 0.005$], whereas the importance of meeting the pharmacist in the clinic significantly increased [$t(33) = -2.74$, $p = 0.01$]. Overall, patients were very satisfied with the services with means ranging from 5.97 to 6.70 on a seven-point Likert scale. Through patient interviews, it was identified that patients valued the pharmacist's initiative to meet them in the clinic, the education provided by the pharmacist and the pharmacist's accessibility throughout treatment.

Conclusion/recommendations: Patients in the ambulatory oncology clinic perceived the services offered as important to their care and they were highly satisfied. Patients valued the pharmacist's role and accessibility during treatment which helped them feel supported. Future direction in this area could involve a multicentre approach, a focus on specific types of cancer or evaluation of the caregiver's perception and satisfaction with clinical pharmacy services.

Encore Presentation (EN)

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Fixed dose 7.5 mg rasburicase is safe and cost-effective in preventing tumour lysis syndrome in adult haematology patients at the University College London Hospitals NHS Trust

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Objective/purpose: Haematological malignancies with a high tumour burden and/or cell turnover are at risk of tumour lysis syndrome (TLS), which is an oncological emergency. Rasburicase prophylaxis is recommended for patients at high risk of TLS development (Cairo et al., 2010) and the licensed TLS prophylactic dose is 200 μg/kg/day. At the University College London Hospitals (UCLH) NHS Trust, Rasburicase prophylaxis is recommended at a 7.5 mg fixed dose in high-risk patients. Here, we assess the efficacy of rasburicase 7.5 mg fixed dose in the prevention of TLS in high-risk adult haematology patients.

Study design/methods: A retrospective audit of high-risk adult haematology patients at the UCLH who received 7.5 mg rasburicase prophylaxis. Patients were identified over a 12-month period from April 2017 using electronic records and reviewed for TLS

development. Cost of fixed dose Rasburicase was compared to the licensed dose.

Results/key findings: Fixed dose 7.5 mg rasburicase was administered to 58 high-risk patients (aggressive non-Hodgkin Lymphoma n = 14, Burkitt's Lymphoma n = 5, acute myeloid leukaemia n = 18, acute lymphoblastic leukaemia n = 9, chronic myeloid leukaemia blast crisis n = 1, chronic lymphocytic leukaemia n = 11). A total of 109 fixed doses were administered. Only 3 out of 58 patients (5.2%) developed TLS (clinical TLS n = 2, 3.4%). Over 12 months at the UCLH, using a rasburicase 7.5 mg fixed dose in high-risk patients resulted in a 54% cost saving compared to the licensed dose.

Conclusion/recommendations: A meta-analysis of adults who received rasburicase prophylaxis reported 7.4% of patients (n = 768) developed clinical TLS (Lopez-Olivo *et al.,* 2013). This is similar to the incidence of TLS in our institution in high-risk patients who received fixed dose rasburicase. Prophylactic fixed dose 7.5 mg rasburicase in patients at high risk of TLS development is safe and cost-effective.

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Treatment outcomes and adherence to imatinib among newly diagnosed patients with chronic myeloid leukemia in Ethiopia: A prospective cohort study

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Objective/purpose: Imatinib (IM) has shown to be efficacious in the treatment of chronic myeloid leukemia (CML), although continuous dosing and patient adherence are essential. The study aimed to assess the treatment outcome and adherence to IM in patients with CML.

Study design/methods: A prospective cohort study was conducted from 1 October 2016 to 30 November 2017 at the Tikur Anbessa Specialized Hospital, Addis Ababa. A total of 147 newly diagnosed patients with CML were followed for three months. Data were collected using a pre-tested data abstraction format designed based on the appointment periods given for the patient. The 8-items MMAS was also used to determine their adherence status at the end of follow-up period. Descriptive statistics were used to summarize the data, while multivariable logistic regression was employed to explore associations among variables of interest.

Results/key findings: Participants' median age at time of confirmed diagnosis was 36 years, with most of them in the age group of <40 years (64.6%). Males comprised 59.2%. After IM initiation, hematologic (40.1%) and gastrointestinal (44.2%) adverse drug events were common and grade III–IV hematologic toxicities were major reasons for physician-led temporary treatment discontinuation in 19 (12.9%) and dose decrement in 5 (14.3%) of patients. Treatment was also discontinued in two patients due to pregnancy. Platelet count $<100 \times 10^3$ cells/mm^3 at IM initiation and being female were significantly associated with temporary treatment discontinuation. Adherence rate to IM was found to be 55.6%. Those who lived in rural area, had low income, adverse effects and comorbidity were significantly associated with IM treatment non-adherence. Most (68.8%) patients missed their medication due to adverse drug events. Apart from the lost-to-follow-up (n = 3), 132 (91.7%) of the patients achieved complete hematologic remission with median treatment response period of six weeks. Peripheral blast count ≥5% (AOR = 0.33, 95%CI: 0.16, 0.79) was found to be predictors for CHR failure, whereas adherence (AOR = 8.60, 95%CI: 4.32, 11.10) was positively associated with CHR.

Conclusion/recommendations: The study showed that CML is commonly diagnosed at a productive age group, with differed clinical presentation. However, outcome does not appear to be different from studies done elsewhere. Overall treatment adherence is suboptimal. Thus, efforts should be made to improve adherence, and further study is required to explore the cytogenetic and molecular responses.

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Managing and mitigating opioid risk: Attitudes, confidence and practices of oncology health professionals

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Objective/purpose: The use of prescription opioids in Canada has increased steadily in the last two decades with stark increases in opioid-related deaths. In

response, national strategies and guidelines have been developed; however, they focus on opioid use for chronic non-cancer pain. In oncology, risk from opioids has been understudied and appears to be underappreciated. There is scant literature on opioid risk evaluation and mitigation and no guidelines on managing aberrant medication taking behavior (AMTB) or opioid use disorder (OUD) in patients with cancer. Given the well-established utility of opioids in cancer care, and the growing emphasis on early palliative care, research is urgently needed to identify knowledge gaps of oncology health professionals. This is crucial in order to determine how best to educate these providers and their patients about the safe and effective use of prescription opioids to minimize potential harms. The objectives for this research are to: (1) explore health care providers' (HCP) confidence and practices in managing opioids and mitigating risk in the cancer population and (2) identify opportunities for education for this group of providers.

Study design/methods: This study's main objective was to assess oncology HCP attitudes, confidence, and practices in managing opioids in persons with cancer in the outpatient setting. Specifically, the areas of focus included: evaluating risk and monitoring for AMTB, OUD and adverse events; managing opioids in patients with AMTB and OUD; and education about opioid use, safe storage and disposal, adverse effects, and overdose management. This was explored using pilot-tested, profession-specific surveys for physicians/nurse practitioners (MD/NP), nurses (RN/CNS) and pharmacists. Data were analyzed in aggregate and separately based on discipline. Descriptive analyses of the survey results were conducted, and regression analyses are planned to explore potential relationships between confidence and practices within and across disciplines.

Results/key findings: The survey was distributed to approximately 400 clinicians in January 2019. We received 65 responses (27 MD/NP, 31 RN/CNS, 7 pharmacists), for an overall response rate of 16%. Thirty-six percent of participants believed that patients with cancer are at low risk for harms related to opioids because they have pain. Fifteen percent believed that patients with cancer frequently become addicted to opioids and 25% that many patients with cancer are at high risk of opioid overdose. Providers lacked confidence in managing AMTB (55% not confident) and providing cancer pain management for a patient with an OUD (69% not confident). Despite the perceived risk of opioid overdose, only 38% of providers frequently provided patients with education about the signs and symptoms of overdose, and only 10% frequently provided education about naloxone use.

Conclusion/recommendations: Participants endorsed limited confidence, and limited and varied practice in managing and mitigating risk of opioids in the cancer population. This study provides valuable insight into gaps in knowledge and training of oncology health professionals. These results will be used to inform the development of evidence-based literature, guidelines, and educational tools aimed at effectively and sustainably closing these gaps.

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Role of clinical pharmacists in reporting and monitoring of radiation-related adverse events in cancer patients: A pilot study

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Objective/purpose: This study was conducted to investigate the role of clinical pharmacists in detection and monitoring of radiation-related adverse events (RRAEs) in cancer patients. We also aimed to study clinical pharmacy interventions intended to manage these RRAEs.

Study design/methods: This was a prospective interventional study conducted at private academic oncology care setting for a period of six months. Patients on radiation therapy or chemo-radiation therapy were enrolled and followed by clinical pharmacists on daily basis to identify RRAEs. Upon identification, RRAEs were discussed with concerned radiation oncologists for authentication and graded as per defined by Radiation Therapy Oncology Group (RTOG). All the study patients were followed to review if they were provided adequate treatment to manage reported RRAEs. Clinical pharmacy interventions were provided to treating physician (on need basis) to ensure adequate treatment/supportive care for reported RRAEs.

Results/key findings: A total of 226 RRAEs were reported from 254 patients followed during the study period. Fatigue (n = 39, 17.2%) was the most common RRAEs reported followed by mucositis (n = 29, 12.8%), pain (n = 23, 10.17%), diarrhoea (n = 23, 10.17%), gastritis (n = 22, 9.7%), proctalgia (n = 20, 8.8%) and vomiting (n = 18, 7.9%). Among the study patients who developed RRAEs, majority

(n = 126, 56%) of them received a combination of chemotherapy and radiation therapy compared to radiotherapy alone (n = 100, 44%). Majority RRAEs were reported in patients who received unfractionated external radiotherapy (n = 142) followed by ICRT (intracoronary radiation therapy) (n = 28), IMRT (n = 27), 3D CRT (three-dimensional conformal radiation therapy) (n = 21) and ILRT (intra luminal radiation therapy) (n = 8). Weekly cisplatin monotherapy was the most common chemotherapy prescribed concurrently to radiotherapy. Among the patients who developed RRAEs, around 68% (n = 154) were started on symptomatic/specific treatment for the respective event(s). However, 32% (n = 72) of patients were not started with any symptomatic or specific care for the reported RRAEs. The most common untreated RRAEs were fatigue (32%) followed by proctalgia (14.5%), gastritis (8.1%), pain (6.5%), mucositis (4.2%) and burning sensation (4.2%). Clinical pharmacists intervened to initiate adequate treatment/supportive care for all untreated RRAEs (n = 72). These interventions were provided in form of reminders to concerned radiation oncologists to issue medication orders or provide instructions for non-pharmacological treatment to manage RRAEs (n = 32), drug information to concerned clinician to manage RRAE (n = 14), dosage adjustments of supportive care used to manage RRAEs (n = 12), patient counselling (n = 10) and by improving availability of medicines required to treat RRAEs (n = 4).

Conclusion/recommendations: Team work of clinical pharmacists with radiation oncologists can be useful to strengthen radiation safety reporting in cancer patients. Interventions made by clinical pharmacists helped to initiate supportive care to patients untreated for their RRAEs.

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Checkmate 384: Phase 3b/4 trial of Nivolumab 480 mg Q4W vs. 240 mg Q2W after ≤12 months of nivolumab in previously treated advanced NSCLC

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Objective/purpose: Nivolumab monotherapy is approved in the EU as 240 mg Q2W for the treatment of locally advanced or metastatic non-small cell lung cancer (NSCLC) after prior chemotherapy. Pharmacokinetic modeling predicts that exposure, efficacy and safety can be maintained with less frequent Q4W dosing. We present an interim analysis of CheckMate 384 (NCT02713867), a phase 3b/4 trial evaluating 480 mg Q4W vs. 240 mg Q2W nivolumab dosing in patients with advanced NSCLC and prior Q2W nivolumab treatment.

Study design/methods: Patients (N = 329) with previously treated stage IIIB/IV or recurrent NSCLC, prior treatment with nivolumab 3 mg/kg or 240 mg Q2W for ≤12 months and ≥2 consecutive assessments of response or stable disease, were randomized 1:1 to nivolumab 480 mg Q4W or 240 mg Q2W. *Co-primary endpoints*: post-randomization progression-free survival (PFS) rates at six months and one year. Secondary endpoints included safety. Due to treatment landscape changes in NSCLC, statistical analyses were amended for reduced sample size; presented analyses are descriptive.

Results/key findings: Median follow-up was 9.5 months (480 mg Q4W) and 10.2 months (240 mg Q2W). Stratified PFS rates were comparable at six months post-randomization: 75% vs. 80% with 480 mg Q4W vs. 240 mg Q2W, respectively. Safety profiles were similar; any-grade treatment-related adverse events (TRAEs) and TRAEs leading to discontinuation were reported in 48% vs. 61% and 6% vs. 9% of patients with 480 mg Q4W vs. 240 mg Q2W. No treatment-related deaths were reported.

Conclusion/recommendations: Nivolumab 480 mg Q4W showed similar efficacy and safety to 240 mg

Q2W in patients with disease control on nivolumab, supporting the potential use of 480 mg Q4W as a more convenient dosing option for second-line NSCLC treatment.

Funding: Funded by Bristol-Myers Squibb.

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Risk factors influencing cardiotoxicity due to trastuzumab in breast cancer: A case-control study at the King Chulalongkorn Memorial Hospital

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Objective/purpose: The study was aimed to study risk factors influencing cardiotoxicity and the association between risk factors and cardiotoxicity due to trastuzumab.

Study design/methods: We performed a case-control study by collected the data from archives patient profiles involving 107 breast cancer patients who received trastuzumab in the Medical Oncology Department, Chulalongkorn Memorial Hospital, between 2005 and 2015. Risk factors included BMI greater than 30 kg/m^2, diabetes mellitus, hypertension and prior radiotherapy in breast cancer were studied.

Results/key findings: Multiple logistic regression was used to analyze data and showed the following results: BMI greater than 30 kg/m^2 (odd ratio = 0.59, 95% confidence interval = 0.060 to 5.902, P = 0.656), diabetes mellitus (odd ratio = 2.24, 95% confidence interval = 0.515 to 9.736, P = 0.282), hypertension (odd ratio = 1.41, 95% confidence interval = 0.406 to 4.865, P = 0.591) and prior radiotherapy in breast cancer (odd ratio = 0.59, 95% confidence interval = 0.202 to 1.716, P = 0.332).

Conclusion/recommendations: From the results, it can be concluded that there were no significant association between above risk factors and cardiotoxicity due to trastuzumab. Nevertheless, larger sample size should be performed to confirm the conclusion of this study.

Funding: Faculty of Pharmacy, Silpakorn University, Thailand.

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Pharmacist and nurse-led melanoma immunotherapy clinic

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Objective/purpose: Immunotherapy (IO) has become the standard of care in melanoma, and over time, this has led to pressures within the medical day unit (MDU), especially as other cancer algorithms have evolved incorporating IO. Main pressures include reduced capacity, increasing patient numbers leading to greater pressure on doctors and requiring greater consultation time with patients to discuss survivorship issues.

To address these pressures, a pharmacist and nurse (P/N)-led clinic was created as a new model of care in 2017. To assess the efficiency of the clinic, the number of referrals made back to the doctor was recorded. In addition, to ensure patients had confidence and trust in the P/N-led clinic, a patient satisfaction questionnaire was conducted.

Study design/methods: Melanoma patients prescribed IO are placed into the clinic and reviewed two to four-weekly as per the IO regimen. Doctors reviewed patients 12-weekly in outpatients for scan results.

To assess the benefit of the clinic, the number of referrals made back to the doctor before 12 weeks were recorded. Consultations needing >10 min to discuss survivorships issues and P/N interventions were recorded. Patients who have been referred to the clinic and been within the care of a P/N for 3–12 months in 2017/2018 were provided a questionnaire consisting of 10 questions evaluating patient's level of trust and confidence in the P/N care using the Likert scale.

Results/key findings: Thirty-six patients (age 24–89 years) have been referred to the clinic; 33 needed IO treatment, 2 steroid weaning and 1 temozolomide patient, needing nursing support. All patients required clinical evaluation for consideration of next cycle. Doctor's input was required for four

patients; two for inpatient admission for IO toxicity (monitoring for adrenal insufficiency, diabetic ketoacidosis), one for a biopsy (new skin nodule), one (scan results).

Interventions routinely made by P/N included referrals to surgeons (3), dermatologist (2), ophthalmologist (2), tissue viability nurse (2), lymphedema team (2), physiological support (2) and fitness instructor (2).

All patients required survivorship support and consultations ranged from 15 to 45 min. Common themes which emerged included how to partake in physical activity, anxiety on stopping IO, financial burden and advice on complementary/alternative therapies.

In the melanoma team, patients stop IO at two years. Discussion on stopping IO is explored within three months of stopping; this discussion has occurred in 18/33 patients, in which the P/N helped alleviate patient's anxiety over this time. This was reflected in the answers within the patient questionnaire, whereby the results were positive with patients either strongly agreeing (7) or agreeing (1) to having confidence and trust in the advice and care provided by the P/N. Two questionnaires not received back from a total of 10 questionnaires handed out.

Conclusion/recommendations: The clinic has become embedded within the melanoma service and has helped improve MDU pressures by removing patients requiring greater holistic support. In turn, this clinic has sought out survivorship issues important to melanoma patients and due to the trust melanoma patients' have with the P/N clinic; the clinic is expanding and led to the creation of a new oral adjuvant clinic.

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Journal of Oncology Pharmacy Practice (ISSN 1078-1552 print; 1477-092X online) is published eight times a year, in January, March, April, June, July, September, October & December by SAGE Publications Ltd (London, Thousand Oaks, CA, New Delhi, Singapore, Washington DC and Melbourne), 1Oliver's Yard, 55 City Road, London EC1Y 1SP, UK.

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JOURNAL OF
ONCOLOGY PHARMACY PRACTICE

ISOPP International Society of Oncology Pharmacy Practitioners

Volume 25 • Issue 8 • December 2019 (Supplement)

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ISSN: 1078-1552