Original Research Article

Medication Calculation and Administration Workshop and Hurdle Assessment Increases Student Awareness towards the Importance of Safe Practices to Decrease Medication Errors in the Future

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ABSTRACT

Background: Medication errors are the second most frequently reported hospital incident in Australia and are a global concern. A "Medication Calculation and Administration" workshop followed by a "hurdle" assessment (compulsory task mandating a minimum level of performance as a condition of passing the course) was introduced into Year 2 of the James Cook University medical curriculum to decrease dosage calculation and administration errors among graduates. This study evaluates the effectiveness of this educational activity as a long-term strategy to teach medical students' essential skills in calculating and administering medications. **Methods:** This longitudinal study used a pre- and post-test design to determine whether medical students retained their calculation and administration skills over a period of 4 years. The ability to apply basic mathematical skills to medication dose calculation, principles of safe administration (Part 1), and ability to access reference materials to check indications, contraindications, and writing the medication order with correct abbreviations (Part 2) were compared between Year 2 and 6 assessments. **Results:** Scores for Parts 1, 2 and total scores were nearly identical from Year 2 to Year 6 (P = 0.663, 0.408, and 0.472, respectively), indicating minimal loss of knowledge by students in this period. Most Year 6 students (86%) were able to recall at least 5 of the "6 Rights of Medication Administration" while 84% reported accessing reference material and 91% reported checking their medical calculations. **Discussion:** The "Medication Calculation and Administration" workshop with a combined formative and summative assessment – a "hurdle" – promotes long-term retention of essential clinical skills for medical students. These skills and an awareness of the problem are strategies to assist medical graduates in preventing future medication-related adverse events.

Keywords: Medical education, medication errors, patient safety

Background

Preventable medication errors continue to prevail worldwide. The World Health Organisation (WHO) reports medication error rates in the developed world of 5%–15% per hospital admission, with one-half of these admissions potentially preventable.[1] In 2009, it was reported medication errors in the United States alone result in at least one death every day and injure approximately 1.3 million people annually.[2] Medication errors resulting in adverse events leading to injury in the United Kingdom account for 2%–15% of hospital admissions and are the single most preventable cause of patient harm[3]

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while 2%–3% of hospital admissions in Australia during 2008 were medication related. Medication errors are the second most frequently reported hospital incidents, costing an estimated $660 million (an increase of $280 million from the 2002 figure).[4]

Although there are approximately forty steps in drug administration,[5] most incidents resulting in harm to patients are in the prescribing process.[5,6] Doctors who have difficulty calculating ratios, mass, concentrations, and percentages are more likely to cause medication errors when calculating dosage.[5,7] A study of 141 tertiary hospital doctors found those who stated that they had never or unlikely ever made a mistake in drug dose calculation scored significantly lower in calculation tests.[5]

Perceptions that prescribing was a "chore" and "represcribing required little thought," along with a culture of not reporting errors, were factors in interns making mistakes.[6,8] Skills in calculating and prescribing medicines are undertrained and underassessed worldwide.[5,6,8-11] The WHO identified that medical students need to understand the nature and scale of medication error, the associated risks of medications, and what can be done to make medication use safer.[12]

Assessment motivates students to learn and influences the amount of time material is studied.[13-15] Formative assessment provides feedback for students to improve their learning and also allows instructors to recognize students who do not grasp key aspects of the training, thus providing them with early intervention. Summative assessment determines if the student should progress by measuring level of proficiency to a set standard.[15] Combining formative and summative approaches provides feedback and intervention on students' strengths and weakness along with deciding if mastery of the skill has occurred and whether repetition is required.[15]

A "hurdle" is an in-course summative assessment with formative principles requiring the student to attain a specific level of competency before progressing. "Hurdle" assessments are repeated until the student is deemed competent, with the student receiving feedback on their performance immediately after each assessment. This also provides students with opportunities for remediation. Best assessment practices in teaching patient safety in medical schools direct the learning toward the needs of a newly graduated doctor, have a strong formative element with regular opportunities for remediation and counseling, and motivate the student to learn.[16] "Hurdle" assessments are consistent with these best practices.

Medical training programs are introducing strategies to address the problem of medication error. These strategies include problem-based training, peer review, and structured teaching and assessment. These strategies have resulted in improved prescribing behaviors and confidence in students and junior doctors.[17-20] Patient safety is paramount in the curriculum at James Cook University (JCU). The "6 Rights of Medication Administration" are considered the foundation of safe prescribing and are introduced in Year 2 along with identifying common errors on a simulated medication chart, which introduces awareness of medication errors and potential consequences.

JCU's College of Medicine program has a spiral or wedge curriculum, which means that principles are introduced early and built upon with complexity in the following years (including Year 5 and 6 prescribing modules). Students commence their medical placements in Year 1, and in their Year 2 placements, they often report being asked to draw up and administer medications. Providing this information in Year 2 allows students to apply safe principles when they practice these skills on placement.

To teach medical students' patient safety, a 2-h scenario-based workshop was implemented that introduces students to safe principles of writing prescriptions and provides opportunities for practice in dosage calculation and administration of medication, along with an awareness of the importance of this skill. As the JCU medical school has a spiral curriculum, these principles and behaviors are built on with increased complexity over the following years.

To maximize learning while ensuring competency, a "hurdle" assessment was introduced following the workshop to reinforce the importance of the concepts presented to the students and to provide feedback on their competency level in medication calculation and administration skills. Content of assessment conveys a message of what is deemed important within the curriculum.[13,14]

Assessing the students' ability to calculate and administer medications in Year 2 not only emphasizes the importance of these essential skills to junior doctors but also ensures student competency is achieved before graduation (duty of care). This paper describes an evaluation of the effectiveness of "hurdle" assessments as an effective educational strategy for teaching medical students' essential skills in medication calculation and administration.

Methods

Study design

This 2009–2013 study of medical students utilized a longitudinal cohort design with a 4-year follow-up. The complete cohort (n = 163) of Year 2 medical students was examined on their ability to undertake medical calculations (the "pretest") after completing a "Medical Calculations and Administration" workshop followed by the hurdle assessment - a type of assessment which is repeated

until the student is competent in that skill. Four years later, at a Year 6 student meeting, 90 of 132 students remaining from the initial cohort completed the same assessment (the "posttest") with an additional cross-sectional survey [Appendix 1]. Seven of the ninety students who completed the assessment for the second time did not identify themselves. Their results in the posttest could not be matched to Year 2 results but were included in other survey data (response rate = 68% [quiz] and 52% [survey]). The students had no warning of the examination and therefore were unable to prepare.

Ethical approval for the study was obtained under the Human Ethics Committee (H3031), conducted in accordance with the Declaration of Helsinki, which does not allow for a control group as it would disadvantage students without access to the intervention.

Medication calculations' "hurdle" workshop

The prereading material made available to students before the workshop presented the consequences of medication errors, principles underpinning safe administration of medications, formulas, and correct abbreviations. The "Medical Calculations and Administration" workshops were delivered in small group sessions where the students were required to apply the principles outlined in the prereading material. Learning outcomes for the workshop were: safety in respect to medication delivery; correct referencing and calculation of medication dosages; manual dexterity skills required to deliver medication; and an awareness of how easily medication errors occur and the importance of reporting them.

The workshop commenced with a Keypad™ quiz to focus students on the concepts to be covered and to determine students' level of understanding. Students then worked through written scenarios, which required the use of reference material and formula application to calculate medications to be prescribed. Relevant topics discussed during the workshop were: the "6 Rights of Medication Safety,"[21] hospital medication charts and sharps, and needlestick safety. Circulating tutors provided support and guidance to the students and recounted their own experiences of medication errors. Individual and/or group practice opportunities were provided to the students through optional quizzes before the "hurdle" assessment (but after the completion of the workshop).

Following the workshop, students were required to complete the summative "hurdle" assessment. This activity aimed to assess student competency in calculation, conversion skills, knowledge of abbreviations, and their ability to use reference material to prescribe medication [Appendix 1]. If the expected standards were not reached, the student was required to resit another assessment containing different questions addressing the same topic. Feedback on the assessment was provided to all students. Any student who did not attain expected standards was given remedial assistance [Figure 1].

Year 2 formative "hurdle" examination, Year 6 quiz, and questionnaire

The Year 2 "hurdle" written assessment [Appendix 1] consisted of 15 short answer questions. The first ten questions, with a required pass mark of 90%, examined students' ability to apply basic mathematical skills to medication dose calculation, identify common abbreviations, and state the principles of safe administration (Part I). The remaining five questions, with a required pass mark of 80%, examined students' ability to access reference materials to check indications and contraindications of the medication, correctly calculate the required dose, and write the order using appropriate abbreviations (Part 2).

In addition to the questions from the original Year 2 quiz, the Year 6 assessment (posttest) asked students to describe the "6 Rights of Medication Administration;" their approach toward the discovery of a medication error; and what skills from the "Medication Calculation and Administration" workshop they consistently applied on their clinical placements. The last seven questions asked students about their confidence in undertaking medication calculations, and how often they performed calculation checks, accessed reference materials, and undertook medication calculations.

Analysis and statistics

Students received one mark for correctly answering each of the 15 questions in the "hurdle" and each response of the

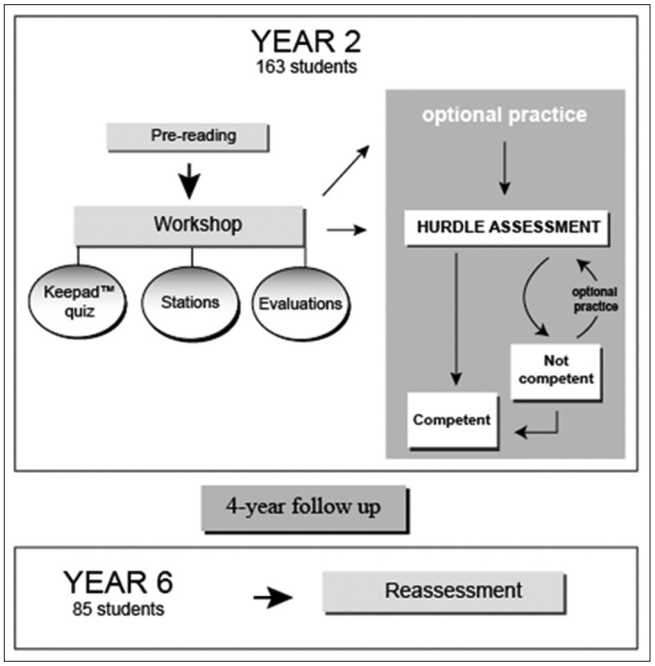

Figure 1: Year 2 "Medication Calculation and Administration" workshop and "hurdle" assessment, and subsequent 4-year follow-up assessment in Year 6

"6 Rights of Medication Administration." Content analysis was conducted "a priori" by the researchers on the free text data gathered for questions such as "What do you do if you find a medication error?" and "What skills from the medical calculation and administration workshop have you applied?."

Data were coded numerically and entered into the computerized statistical package SPSS (IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corporation, NY, USA). Frequency analyses described students' approaches toward discovering a medication error and what skills acquired in the medical calculation and administration workshop had been applied in clinical placements. For the bivariate analysis comparing the Year 6 students' examination results to their Year 2 results, *P* values were calculated using two-tailed, paired *t*-tests.

Results

The mean scores for medical calculations (Parts 1 and 2) and total score (Part 1 score + Part 2 score) for the same examination given in Year 2 and again in Year 6 were not significantly different on paired samples *t*-test for Part 1 ($P = 0.66$), Part 2 ($P = 0.41$), or total score ($P = 0.57$). In addition, 86% (74/86) of the Year 6 students were able to recall either 5 or 6 of "The 6 Rights of Medication Administration" with a further 9% (8/86) recalling 4 of the 6. The number of students requiring reassessment in the 2009 and 2010 cohorts was 20% and 16%, respectively.

Self-reported patient safety behaviors adopted by Year 6 students in clinical situations were: 85% (69/82) accessed reference material; 90% (73/81) checked their medical calculations; 41% (32/78) used the skills from the workshop on clinical placement; and 38% (30/81) asked someone else to check their medication calculations. Fifteen of 83 students (18%) were "very confident" in calculating medicine dosages, and 10/82 (12%) students were "very confident" at drawing up parenteral medicines. However, 52/83 (63%) reported being either "confident" or "very confident" in medical calculations, and 50/82 (60%) students reported being either "confident" or "very confident" in drawing up parental medications.

When asked what they would do if they discovered a medication error [Figure 2], 61% (52/85) of Year 6 students stated that they would notify the supervising doctor, 26% (22/85) would choose to advise the nurse to not administer the medication, 20% (17/85) would involve the pharmacist, 19% (16/85) would monitor the patient for adverse effects, and 5% (4/85) would employ workplace protocols in place, so the same mistake would not be repeated. The workshop skills most commonly applied by students in their clinical practice were: calculation of doses (37%); referencing information to make

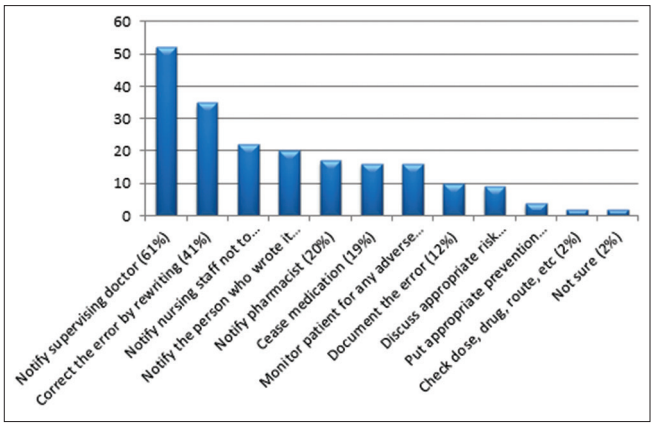

Figure 2: Actions taken by Year 6 students if a medication error is found ($n = 85$)

decisions (11%); use of medication charts (8%); and applying knowledge of abbreviations (7%).

Discussion

This study demonstrates no measurable loss of knowledge toward medication calculation and administration in medical students despite a 4-year gap from the time of learning to the follow-up assessment. In addition, students reported that many of the skills taught in the "Medication Calculation and Administration Workshop" were useful on their various clinical placements across years 2–6.

The application of these skills by students in clinical practice and the reported student attitudes toward medication calculations and administration suggests that the combination of a workshop and a "hurdle" assessment is likely to strengthen best practices in health care. These best practices, in turn, are likely to improve patient safety. In addition, the assessment component ("hurdle") drives learning in the intended direction of meeting the exit learning outcomes of a newly graduated doctor: patient-centered care and a focus on patient safety.[16]

Nearly all Year 6 students reported checking reference material before prescribing medications at least "sometimes." Furthermore, nearly all students identified patient safety issues with prescribing on clinical placements. This awareness of safety issues and use of strategies are intended learning outcomes of the workshop and aim to change the reported culture of medical interns as describing prescribing activities as a "chore" and stating that "represcribing requires little thought." These were identified as key factors in interns making mistakes.[6,9]

A smaller number of students reported being "very confident" in calculating medicine dosages and drawing up parenteral medicines when compared with the number of students that reported being "confident." This reflects a larger number of

students feeling confident in these skills and a small number being overconfident. Thus, the workshop has likely achieved its intended learning objectives to build confidence in students by providing opportunities for safe practice in medication calculation skills but also avoiding overconfident behaviors by increasing student awareness toward medication prescription errors. A previous study found that junior doctors were at a higher risk of making medication errors when compared to more senior doctors[5] and that doctors who reported "never" or "rarely ever" making a mistake in a drug calculation scored significantly lower in the calculation tests than those who admitted past errors. The awareness of potential for error may result in the future graduates being more likely to perform safety checks and hence less likely to make errors.

The vast majority of Year 6 students stated that they would report an identified medication error to their supervisor. Many students also reported that they would further notify the nurse, pharmacist, and/or patient, with a small number even suggesting to develop protocols in place to prevent reoccurrence of such events in the future. Roughead and Semple[4] reported that only 40% of doctors, compared to 100% of nurses, actually reported medication errors requiring intervention. Sarvadikar *et al*. found that 43% of doctors, 68% of nurses, and 64% of pharmacists stated that they were likely to report a drug error.[3]

An intended learning objective of the Year 2 workshop was to inform students that errors must be reported for patient safety measures to be actioned and for system change to occur. The results of this study indicate that a higher majority of our graduates stated that they would take action regarding a medication error than in the current culture; however, what actually will happen in the future clinical settings is uncertain.

Although over one-third of Year 6 students remembered all "6 Rights of Medication Administration," nearly all students in this group identified at least 5 of the 6 rights - patient, drug, dose, time, and route. Other answers for the 6th right, such as the indication for medication administration and allergies, were considered incorrect as the correct answer was "documentation."[21]

The main limitation of this study is the pre- and post-test study design. The JCU Human Ethics Committee does not allow for controlled trials in medical education as they feel this approach would likely disadvantage some students. While a pre- and post-test study design is suitable for this particular scenario, it does not allow any determination of the impact of the medication errors workshop on student proficiency in medical calculations, nor opportunities for learning prescription writing under the guidance of instructors in their 5th and 6th year of medical school. However, records show that 20% and 16% of students in 2009 and 2010, respectively, were required to resit the hurdle assessment, indicating that the examination is not too easy. Further, learning prescription writing in the 5th and 6th years would assist with the referencing and the safety questions but would not impact on the mathematical component of the assessment.

In addition, the pre- and post-test analysis of examination score was undertaken on only 53% (83/163) of the original 163 Year 2 students, raising concerns for potential biases due to loss of follow-up. Of the 163 Year 2 students who completed the "hurdle" in 2009, 28 students had deferred their studies for at least 1 year, 3 students withdrew from the course, 29 were on their overseas elective or rural internship in a remote site at the time of the posttest, 15 did not fill out the posttest (because they were not present on the day or chose not to), and a further 5 did not identify themselves on the posttest examination. Analysis of the students who did and did not repeat the examination in the 6th year showed a higher percentage of those who did fill out the posttest were awarded a "distinction," or higher (32% vs. 14%) and a lower percentage had to repeat the year (3% versus 14%) compared to those who did not fill out the posttest though percentages of students receiving a "credit" or "pass" level – approximately 70% of the cohort – were very similar between the two groups. These differences are likely to be mostly due to the academically struggling students deferring or withdrawing from the course by Year 6 and may have contributed somewhat to the closeness of examination scores between Year 2 and Year 6.

Finally, while the majority of students stated that they would report an identified medication error, it is unknown what they would do in a real life situation. Studies report that medical personnel are less likely to report errors. With this fact in mind, a main aim of the workshop and hurdle is to challenge the current culture of not reporting errors by increasing awareness in students of the importance of reporting errors for patient safety and initiating changes in the system.[3,4]

Conclusion

The "Medication Calculation and Administration" workshop with a combined formative and summative activity – a "hurdle" assessment – appears to promote the retention of essential clinical skills by medical students over 4 years. The workshop content and assessment are also relevant to the skills required in clinical practice, thus reinforcing the importance of these skills in the clinical setting. The "Medication Calculation and Administration" workshop with "hurdle" assessment provides medical students with long-term knowledge related to safe calculation and administration behaviors. While it cannot be evaluated whether this workshop and hurdle will result in fewer medication-related adverse events, making JCU medical graduates aware of the problems in this area is the first step

in changing the culture around reporting patient safety errors and initiating changes in the system.

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Conflicts of interest

There are no conflicts of interest.

References

1. World Health Organisation. Patient Safety Workshop: Learning from Error. Available from: http://www.who.int/patientsafety/activities/technical/vincristine_learning-from-error.pdf. [Last accessed on 2016 Apr 17].
2. US Food and Drug Administration. Drugs: Safety and Availability Medication Errors Report. Available from: http://www.fda.gov/Drugs/DrugSafety/MedicationErrors/ucm080629.htm. [Last accessed on 2016 Apr 17].
3. Sarvadikar A, Prescott G, Williams D. Attitudes to reporting medication error among differing healthcare professionals. Eur J Clin Pharmacol 2010;66:843-53.
4. Roughead EE, Semple SJ. Medication safety in acute care in Australia: Where are we now? Part 1: A review of the extent and causes of medication problems 2002-2008. Aust New Zealand Health Policy 2009;6:18.
5. Simpson CM, Keijzers GB, Lind JF. A survey of drug-dose calculation skills of Australian tertiary hospital doctors. Med J Aust 2009;190:117-20.
6. Coombes ID, Stowasser DA, Coombes JA, Mitchell C. Why do interns make prescribing errors? A qualitative study. Med J Aust 2008;188:89-94.
7. Rolfe S, Harper NJ. Ability of hospital doctors to calculate drug doses. BMJ 1995;310:1173-4.
8. Garbutt JM, Highstein G, Jeffe DB, Dunagan WC, Fraser VJ. Safe medication prescribing: Training and experience of medical students and housestaff at a large teaching hospital. Acad Med 2005;80:594-9.
9. Pillans P. How prepared are medical graduates to begin prescribing? Intern Med J 2009;39:425-7.
10. Rodrigues J, Sengupta A, Mitchell A, Kane C, Kane C, Maxwell S, *et al*. The Southeast Scotland Foundation Doctor Teaching Programme – Is "near-peer" teaching feasible, efficacious and sustainable on a regional scale? Med Teach 2009;31:e51-7.
11. Hilmer SN, Seale JP, Le Couteur DG, Crampton R, Liddle C. Do medical courses adequately prepare interns for safe and effective prescribing in New South Wales public hospitals? Intern Med J 2009;39:428-34.
12. World Health Organisation. Patient Safety Curriculum Guide; Multi Professional Edition. Available from: http://www.apps.who.int/iris/bitstream/10665/44641/1/9789241501958_eng.pdf. [Last accessed on 2016 Apr 17].
13. Cilliers FJ, Schuwirth LW, Herman N, Adendorff HJ, van der Vleuten CP. A model of the pre-assessment learning effects of summative assessment in medical education. Adv Health Sci Educ Theory Pract 2012;17:39-53.
14. Race P, Pickford R. A Compedium of Extracts on Assessment. Available from: https://www.i.unisa.edu.au/Global/LTU/Assessment/Assessment%20Digest%20-%20extracts%20from%20recent%20books%20-%20Phil%20Race%20long%20version.pdf. [Last accessed on 2016 Apr 17].
15. Friedman Ben-David M. Principles of assessment. In: Dent JH, Harden R. editors. A Practical Guide for Medical Teachers. 3rd ed. China: Elsevier Ltd.; 2010. p. 303-5.
16. World Health Organisation. WHO Patient Safety Curriculum Guide for Medical Schools. Available from: http://www.who.int/patientsafety/information_centre/documents/who_ps_curriculum_summary.pdf?ua=1. [Last accessed on 2016 Apr 17].
17. Celebi N, Weyrich P, Riessen R, Kirchhoff K, Lammerding-Köppel M. Problem-based training for medical students reduces common prescription errors: A randomised controlled trial. Med Educ 2009;43:1010-8.
18. Sandilands EA, Reid K, Shaw L, Bateman DN, Webb DJ, Dhaun N, *et al*. Impact of a focussed teaching programme on practical prescribing skills among final year medical students. Br J Clin Pharmacol 2011;71:29-33.
19. Halbach JL, Sullivan LL. Teaching medical students about medical errors and patient safety: Evaluation of a required curriculum. Acad Med 2005;80:600-6.
20. Scobie SD, Lawson M, Cavell G, Taylor K, Jackson SH, Roberts TE. Meeting the challenge of prescribing and administering medicines safely: Structured teaching and assessment for final year medical students. Med Educ 2003;37:434-7.
21. Tollefson J. Clinical Psychomotor Skills: Assessment Tools for Nursing Students. 4th ed. Melbourne: Centage Learning Australia Pty Ltd.; 2010.

Appendix

Appendix 1: Pre- and post-test questions and survey

1. A client is prescribed 75mg Ascorbic Acid. The stock strength is 50mg. How many tablets will be given?

2. A patient is ordered IVI Diazepam 7.5mg. Stock strength is 10mg/2ml. Calculate the volume of drug to be given.

3. Jane Moxon has been ordered 60mg IV frusemide. The stock on hand is 40mg/ml. How many mls does she require?

4. Matt Brown, aged 75 years, has been ordered a stat dose of 0.125mg digoxin intravenously. The stock on hand is 250mcg/2ml. How many mls does he require?

5. Sienna Baldwin who weighs 12kg has been ordered 0.3g cefotaxime IV for severe pneumonia. The drug in stock is 1g powder reconstituted to 2mls with water. How many mls are required for Sienna?

6. Mona Jones, aged 45 years and weighing 65kg, has been ordered enoxaparin 1mg/kg twice daily by subcutaneous injection. Enoxaparin comes in 100mg/ml ampoules. How much enoxaparin needs to be drawn up for her morning dose?

7. Greta Jameson has been ordered IM ketamine 5mg/kg prior to having an excision of a large abscess on her thigh. Greta is 69 years of age and weighs 85kg. Ketamine comes as 100mg/ml. How many mls are required for her dose?

8. Which of the following is the highest concentration, A, B or C?
   A) Heparin 5000 IU in 1ml
   B) Heparin 12,500 IU in 0.5ml
   C) Heparin 35000 IU in 35ml

9. Convert the following:
   0.3 mg = _____ microgram 450 mL = _____ L

10. Give the definition of the following:
    Mane_____
    IM

3 year old Ryan Smith who weights 15kg has been brought into your practice by his parent with an on-going history of sore ear, fever and generally unwell. On examination, you diagnose severe otitis media and decided to prescribe Ceclor (cefaclor monohydrate). An extract from eMIMS v 5.0 is provided below for your reference:

11. What is the dose/kg/day?

12. How many times will he take cefaclor monohydrate in a day? (This could be a range)

13. List two precautions to be aware of when prescribing this drug.

14. State one contraindication to taking this drug.

15. List two indications for cefaclor monohydrate.

This part of the questionnaire is anonymous

Q1. What are the six rights of medication administration?

Q2. In the event that you discover a medication error, what do you do?

Q3. What skills from the Medication Calculation and Medication Workshop did you apply on your clinical placements and hospital rotations?

The following questions use a likert scale. Please circle the word which best describes your response.

Q4. How often do you access reference material before prescribing medication?
Never Occasionally Sometimes Most of the time Always

Q5. How often do you check your medication calculations?
Never Occasionally Sometimes Most of the time Always

Q6. How often do you ask someone else to check your medication calculations?
Never Occasionally Sometimes Most of the time Always

Q7. How confident are you in calculating drug dosages?
Not confident at all Somewhat confident Confident Very confident

Q8. How confident are you in drawing up parenteral medication?
Not confident at all Somewhat confident Confident Very confident

Q9. How often did you use the skills presented in this workshop in your clinical placements?
Never Occasionally Sometimes Most of the time Always

Q10. Participating in the workshop has enabled me to identify patient safety issues with respect to medication calculation and administration…
Strongly disagree Disagree Neutral Agree Strongly agree