Evaluation of a filmed clinical scenario as a teaching resource for an introductory pharmacology unit for undergraduate health students: a pilot study

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Evaluation of a filmed clinical scenario as a teaching resource for an introductory pharmacology unit for undergraduate health students: A pilot study

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**Article info**

**Keywords:** Simulation, Midwifery, Nursing, Teaching, Pharmacology

**Summary**

**Background:** Simulation is frequently being used as a learning and teaching resource for both undergraduate and postgraduate students, however reporting of the effectiveness of simulation particularly within the pharmacology context is scant.

**Objectives:** The aim of this pilot study was to evaluate a filmed simulated pharmacological clinical scenario as a teaching resource in an undergraduate pharmacological unit.

**Design:** Pilot cross-sectional quantitative survey.

**Setting:** An Australian university.

**Participants:** 32 undergraduate students completing a healthcare degree including nursing, midwifery, clinical science, health science, naturopathy, and osteopathy.

**Methods:** As part of an undergraduate online pharmacology unit, students were required to watch a filmed simulated pharmacological clinical scenario. To evaluate student learning, a measurement instrument developed from Bloom’s cognitive domains (knowledge, comprehension, application, analysis, synthesis and evaluation) was employed to assess pharmacological knowledge conceptualisation and knowledge application within the following fields: medication errors; medication adverse effects; medication interactions; and, general pharmacology.

**Results:** The majority of participants were enrolled in an undergraduate nursing or midwifery programme (72%). Results demonstrated that the majority of nursing and midwifery students (56.52%) found the teaching resource complementary or more useful compared to a lecture although less so compared to a tutorial. Students’ self-assessment of learning according to Bloom’s cognitive domains indicated that the filmed scenario was a valuable learning tool. Analysis of variance indicated that health science students reported higher levels of learning compared to midwifery and nursing.

**Conclusion:** Students’ self-report of the learning benefits of a filmed simulated clinical scenario as a teaching resource suggest enhanced critical thinking skills and knowledge conceptualisation regarding pharmacology, in addition to being useful and complementary to other teaching and learning methods.

**Introduction**

Medication errors are one of the most common errors within healthcare settings and are associated with considerable cost, morbidity and in some instances mortality (Institute of Medicine, 2006). Although errors can occur at any stage of medication management, they occur most commonly during the prescribing and administration stages (Institute of Medicine, 2006). As healthcare professionals, particularly nurses and midwives are primarily responsible for administering medication (Aspden et al., 2007), it is essential to ensure they are equipped with appropriate pharmacological knowledge and the skills necessary to ensure safe medication administration. Despite medication administration being a fundamental skill, and graduating students are deemed competent to safely manage medication administration, nurses, midwives and other healthcare graduates report feeling ill-equipped and unprepared to prescribe and administer medications to patients in the clinical setting (O'Shaughnessy et al., 2010; Thompson and Bonnel, 2008). One approach to consolidating pharmacological knowledge and enabling its clinical application is through the use of simulation.

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Background/Literature

The lack of preparedness reported by newly graduated healthcare professionals has been attributed to a number of factors such as: course structure, teaching staff not possessing pharmacological training or adequate knowledge, insufficient assessment of students’ ability to safely administer and prescribe medications, lack of supervision in the clinical setting, and the complex pharmacological requirements needed to treat patient conditions (Maxwell, 2012; O’Shaughnessey et al., 2010; Thompson and Bonnel, 2008). Critically, pharmacology may not be taught as an individual unit in some programmes, or if it is, it is often delivered solely as a theoretical unit in the absence of a clinical application component (Thompson and Bonnel, 2008). Delivering a pharmacology unit without embedding the clinical applications risks surface learning, with students failing to interact with the material through considered application to the clinical setting, resulting in a lack of consolidated pharmacological knowledge (Thompson and Bonnel, 2008).

Simulation, the replication of a potential real-life event in a simulated environment that is similar to that in which the event may occur (Hunt et al., 2006), is increasingly being used for teaching and learning purposes in both undergraduate and postgraduate degrees (Yuan et al., 2012). Simulation features strongly in nursing and other health science undergraduate curricula, with the educational benefits of simulation as a teaching tool widely acknowledged (Berragan, 2011). Various forms of simulation have been demonstrated to enhance learning and the conceptualisation of clinical knowledge and skills. Among nursing and medical students, simulation is recognised to improve the application of pharmacological knowledge within the clinical setting (Thompson and Bonnel, 2008; Yuan et al., 2012). However, the evaluation of learner's experiences with simulated clinical skills development is an emerging field (Ricketts, 2011), and the benefits of simulation via filmed clinical scenarios to enhance the application of pharmacological knowledge among healthcare professionals is unclear. This pilot study aimed to evaluate whether a filmed simulated pharmacology scenario enhanced knowledge conceptualisation and knowledge application to the clinical setting among undergraduate Health and Human Science students.

Research Design

This study utilised a cross-sectional quantitative survey that had been designed to collect student’s perceptions on a filmed simulated clinical scenario. To evaluate the scenario and associated student knowledge, the survey was designed using Bloom’s Taxonomy of cognitive processes (Marzano and Kendall, 2007). The survey evaluated whether after viewing the simulated scenario the students learning was enhanced in the areas of medication errors, adverse effects, medication interactions and general pharmacological knowledge. Ethics approval for this study was granted by the relevant University Human Research Ethics Committee. Completion of the survey was considered implied consent.

The study was conducted in 2013 with students (primarily nursing and midwifery students) enrolled in an undergraduate introductory pharmacology unit at an Australian regional University. There were 96 students enrolled in the unit. For the purposes of this preliminary exploratory study a sample of at least 30 was considered sufficient, and is in line with similar nursing research studies (Hertzog, 2008). Initially, students were required to watch a filmed simulated scenario focused on medication administration and the associated pharmacological effects made available to students via an online learning platform. After which several announcements and emails were sent to students enrolled in the unit of study providing the information sheet and inviting them to participate in the study. Due to this research being a part of a fully online unit, administering the survey during class time was not possible, therefore, to maximise uptake of the survey, a one-off reminder phone contact from a research assistant was made with students.

The scenario was filmed by a professional Educational Multimedia Technologist and involved two academics: one who role played as a nurse, whilst the other was the voice of the SimMan 3G used for this study. The scenario was based on a case study of which an 86 year old man was admitted to hospital for investigation of a febrile illness. During the scenario the patient had the following: (i) an allergic response to a medication administered by the nurse, (ii) experienced hypotension and bradycardia subsequent to further medications, and (iii) experienced drowsiness and a fall. Further, during the administration phase, the nurse made several errors including giving the wrong dose of medications, and administering medications that interacted and or were contraindicated for the patient’s deteriorating health, which resulted in the patient requiring urgent medical attention. Once the students had viewed the scenario they were then required to identify the patient’s condition and how the pharmacological agents were associated with improvement or deterioration of the patient’s symptomology.

Measures

The survey consisted of a mix of fixed response items inclusive of 24 Likert scale items (1 = agree to 5 = strongly disagree) and six open-ended questions. The 24 item Likert scale was divided into four sections that elicited students self-report on the extent to which watching the filmed scenario enhanced their knowledge and skills of: medication errors, medication adverse effects, medication interactions and general pharmacology knowledge. Each of these four sections included six items which were developed to assess Bloom’s Taxonomy domains of knowledge, comprehension, application, analysis, synthesis and evaluation (Marzano and Kendall, 2007). Fig. 1 provides an example of question types for the section relating to knowledge of medication errors. The remaining questions on the survey focused on demographic details, student perceptions on the comparability of this type of learning when compared to traditional tutorials and lectures (5 = more useful to 1 = less useful), and general open-ended questions asking students’ perceptions and thoughts of the scenario.

Analysis

Survey data was downloaded from the Qualtrics® platform and analysed using Statistic Package for Social Sciences (SPSS) version 20. Initially the data was analysed using descriptive statistics to identify logical responses and the extent of missing data. After which analysis to establish the normality of data distribution was undertaken. Sum score variables were created from the items measuring each of the cognitive domains and fields of pharmacology knowledge. Similarly for the variables that provided a rating compared to a lecture or tutorial the categories were condensed (less useful, equally useful, useful, very useful in a different way, more useful) to provide a dichotomous variable (less useful, useful) suited to analysis To explore statistical relationships between the variables frequency distributions, including mean and standard deviations, Spearman’s correlations, Kruskal-Wallis analysis of variance and ANOVA were performed.

Results

Thirty two students completed the survey out of total sample of 96, equating to a response rate of 30.72%, which was deemed adequate for this exploratory pilot study. This is also consistent with literature that asserts low response rates are typical among students, particularly when surveys are administered online compared to in-class time (Dommeley et al., 2004).
Demographic Data

Basic demographic details inclusive of discipline and age are presented in Table 1. The majority of students were enrolled in either an undergraduate nursing or midwifery programme, with the remaining students being enrolled in either a clinical sciences, health science, naturopathy and osteopathy courses. The majority of students were under the age of 25 years of age.

Reliability and Validity

Initially, to determine the reliability and internal consistency of the scale Cronbach’s alpha coefficients were undertaken (Elliot, 2007). The Cronbach’s alpha for the entire scale was 0.98. For the 4 subscales, the scale for medication interactions yielded the highest Cronbach’s alpha (0.96), followed by pharmacology in general at 0.94, medication errors at 0.93 and medication adverse effects which yielded a Cronbach’s alpha of 0.92. Considering the Cronbach’s alpha for the scale and each subscale was over 0.90, the internal consistency reliability for the scale is high (Pallant, 2011).

To establish content validity the scale was reviewed by five fellow academics with regard to clarity of wording and content (Elliot, 2007). Of the five academics, one was considered an expert in teaching and learning, two academics had significant statistical and survey development experience and the remaining two were considered experts in acute care inclusive of pharmacological knowledge, each provided feedback and reviewed the survey a number of times until there was consensus on the clarity of the items. This process allowed for expert evaluation and was considered appropriate as the tool was being developed for the purposes of this study (Elliot, 2007).

Table 1

<table>
<thead>
<tr>
<th>Discipline</th>
<th>n=</th>
<th>%</th>
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<td>31</td>
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<tr>
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<td>3</td>
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<tr>
<td>Naturopathy</td>
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<td>3</td>
</tr>
<tr>
<td>Other (osteopathy)</td>
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<td>3</td>
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<tr>
<td>Total</td>
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<td>100</td>
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<table>
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<tr>
<td>Total</td>
<td>32</td>
<td>100</td>
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</table>

Students Rating of the Scenario as a Learning Tool

The majority of students reported the filmed clinical scenario was useful in a different but complementary way in comparison to a lecture (45.5%) and tutorial (27.3%). Notably, students were more likely to report the filmed scenario was less useful than a tutorial (21.2%), and when compared to a lecture, only 3% reported the filmed scenario was less useful. Further cross tabulations were performed to identify whether students from different courses rated the scenario more or less useful when compared to a lecture and tutorial. The majority of nursing and midwifery students (n = 19) indicated that the scenario was either useful in a different way or was more useful than attending a lecture. However, compared with a tutorial these students (n = 12) indicated that the scenario was less useful or equally useful, compared to being more useful. A very small number of students responded they were unsure about the benefits of the scenario. There was a significant correlation between the number of times the filmed scenario was watched and students’ rating of the filmed scenario when compared to a lecture (rho = .417 * .018) and tutorial (rho = .428 * .015). Comparative analysis of whether the filmed scenario was more useful when compared to a lecture or tutorial according to degree types (nursing and midwifery and other health sciences) indicated no statistical significance between the groups (rating compared to lecture U 87.00 p = 0.509, rating compared to tutorial U 82.500 p = 0.360).

Bloom’s Cognitive Domains and Associated Pharmacological Knowledge

Analysis of variance according to undergraduate degrees (midwifery, nursing, and other health sciences) and the reported learning benefit according to Bloom’s Cognitive domains identified a statistically significant variance between nursing and other health science students in the domain of Evaluation, and a statistically significant variance for midwifery and other health science students in the domains of Evaluation and Synthesis. Further analysis of variance between nursing and other health science, and midwifery and other health science indicated a statistically significant variance between these groups for the cognitive domains of Evaluation and Synthesis, and the domains of General Pharmacology knowledge, Medication errors, and Medication adverse events (Table 2). Whilst the filmed scenario was rated favourably as a learning tool for all students, mean scores for the various items reported from the ANOVA identified that health science students rated the filmed scenario significantly more favourably than nursing and midwifery students. Further between groups comparison was undertaken for students who rated the filmed scenario as less helpful or helpful as a learning tool when compared to a lecture and tutorial and the reported learning benefits. For rating of the filmed scenario when compared to a lecture this analysis identified statistically significant relationships between a number of cognitive domains (Synthesis, Application, Analysis) and domains of pharmacology knowledge (Errors, General pharmacology knowledge, Interactions, Adverse events) (see Table 3).
In this study, students rated the filmed simulated scenario as more useful than a lecture in enhancing knowledge associated with all pharmacology knowledge fields (medication errors, medication adverse effects, medication interactions and pharmacology in general) and the cognitive domains of Synthesis, Application and Analysis cognitive domains. One reason for these results could be that the filmed clinical scenario required students to problem solve through analysing the scenario to determine what was happening to the patient. In order for this to occur, students firstly needed to understand and make sense of the scenario or in Bloom’s terminology comprehend the case study. Moreover, these results also recognise that in order for the students to determine and make judgments associated with the scenario, the students were required to draw on existing knowledge and utilise critical thinking and reflection. According to Bloom’s taxonomy, evaluation encapsulates the processors of analysis, synthesis, knowledge and application and involves determining judgments based on knowledge (Bloom, 1956). Therefore, evaluation is a higher level thought process that requires drawing on existing knowledge and problem solving skills. Considering this, it can be postulated that the filmed simulated scenario promoted students to utilise critical thinking and reflect on their pharmacological knowledge to determine the causes of the patient’s health outcomes.

Critical thinking and reflection are essential elements of the nursing and midwifery professions and are essential competencies that healthcare professionals must demonstrate in order to deliver safe patient care inclusive of safe pharmacological management (Ballock and Manias, 2011; Jones, 2013). Previous literature has indicated that simulation used for educational purposes can enhance critical thinking among nurses (Cant and Cooper, 2009), which concurs with the current study’s findings. Similarly, research focused on evaluating the use of simulation for a number of courses including pharmacology, reported that the use of simulation can assist nursing students to synthesise and apply theoretical knowledge (Sharpnack and Madigan, 2012). Furthermore, previous research focused on evaluating simulation teaching strategies compared to more traditional methods such as lectures also noted that using simulation as a teaching resource can enhance knowledge associated with pharmacological agents (Marei and Al-Jandan, 2013) which this study also supports.

**Limitations**

The small sample size in this study although considered adequate, is also considered a limitation of this study. Further research using a larger sample size is needed to determine if filmed clinical scenarios are beneficial across all undergraduate health students and within differing contexts. Additionally, further research to determine the benefits of high fidelity simulation compared to low fidelity simulation and students active compared to passive engagement would be beneficial to
determine effective pharmacological teaching and learning resources for undergraduate healthcare students.

Conclusion

This study found that the use of a filmed simulated clinical scenario is beneficial in improving pharmacological knowledge among undergraduate healthcare students. Results indicated that this type of teaching resource is an effective tool in improving and assisting students, to reflect and apply critical thinking skills within the context of pharmacology. Furthermore, findings also indicated that using this type of teaching resource can complement other teaching methods particularly lectures and can aid students to consolidate and apply their theoretical knowledge associated with pharmacology.

References


