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A multi-disciplinary approach to medication safety and the implication for nursing education and practice

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SUMMARY

Background: Medication management is a complex multi-stage and multi-disciplinary process, involving doctors, pharmacists, nurses and patients. Errors can occur at any stage from prescribing, dispensing and administering, to recording and reporting. There are a number of safety mechanisms built into the medication management system and it is recognised that nurses are the final stage of defence. However, medication error still remains a major challenge to patient safety globally.
Objectives: This paper aims to illustrate two main aspects of medication safety practices that have been elicited from an action research study in a Scottish Health Board and three local Higher Education Institutions: firstly current medication safety practices in two clinical settings; and secondly pre and post-registration nursing education and teaching on medication safety.
Method: This paper is based on Phase One and Two of an Action Research project. An ethnography-style observational method, influenced by an Appreciative Inquiry (AI) approach was adapted to study the everyday medication management systems and practices of two hospital wards. This was supplemented by seven in-depth interviews with nursing staff, numerous informal discussions with healthcare professionals, two focus-groups, one peer-interview and two in-depth individual interviews with final year nursing students from three Higher Education Institutions in Scotland.
Result: This paper highlights the current positive practical efforts in medication safety practices in the chosen clinical areas. Nursing staff do employ the traditional 'five right' principles – right patient, right medication, right dose, right route and right time – for safe administration. Nursing students are taught these principles in their pre-registration nursing education. However, there are some other challenges remaining: these include the establishment of a complete medication history (reconciliation) when patients come to hospital, the provision of an in-depth training in pharmacological knowledge to junior nursing staff and pre-registration nursing students.
Conclusion: This paper argues that the 'five rights' principle during medication administration is not enough for holistic medication safety and explains two reasons why there is a need for strengthened multi-disciplinary team-work to achieve greater patient safety. To accomplish this, nurses need to have sufficient knowledge of pharmacology and medication safety issues. These findings have important educational implications and point to the requirement for the incorporation of medication management and pharmacology in to the teaching curriculum for nursing students. There is also a call for continuing professional development opportunities for nurses working in clinical settings.

Background

Medication management is a key aspect of patient safety in 21st century global healthcare systems. Unintended and adverse clinical incidents including medication errors can cost human lives, prolong hospital stays and may also have serious financial implications for health services. Fast moving and pressurised healthcare working environments are one of the major challenges related to patient safety (WHO, 2011; IOM, 2004).

There have been phenomenal advancements in medical science and consequent changes in the global healthcare system. Knowledge and the technology to diagnose illnesses and manage complex health conditions are expanding. Improvements in making diagnosis, treating illness and recovery processes have transformed human morbidity and mortality. As a result, people with chronic and co-morbid conditions live longer in their own homes or in healthcare institutions and are increasingly dependent on complex therapeutic regimes.

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The Director-General of the World Health Organization (WHO), Chan summarises the challenges we face in the contemporary healthcare working environment (WHO, 2011). She states:

> "One of the greatest challenges today is not about keeping up with the latest clinical procedures or the latest high-tech equipment. Instead, it is about delivering safer care in complex, pressurized and fast-moving environments. In such environments, things can often go wrong. Adverse events occur. Unintentional, but serious harm comes to patients during routine clinical practice, or as a result of a clinical decision."

In relation to medication safety, Guwande, a US hospital based surgeon and global patient safety expert suggests that there are over six thousand drugs that are licensed to be prescribed in the global healthcare market today (Guwande, 2012).[4] Not only has the sheer number of available medications increased but also the amount of medicine consumed by individuals in their lifetime. Martin (2007) suggests that on average, a British person consumes 14,000 pills in his/her lifetime. More medication means higher associated risks and higher chances of adverse incidents. To further add to this complexity, not only are trained medical doctors licensed to prescribe medication but an increasing number of nurses and allied health professionals are trained and licensed to prescribe (Sulosaari et al., 2010; Lymn et al., 2008). In addition to this, an increasing number of medications are available to buy over-the-counter (and increasingly online) in the UK and most other parts of the world. All these initiatives have implications on medication management and patient safety (Bradley and Blenkinsopp, 1996).

Understandably, there has been increased awareness of medication safety in the healthcare system and this has been considered by patient safety experts as one of the high risk areas on a par in broad safety terms with the aviation, nuclear power plant and high risk construction industries (Caldwell, 2012; Guwande, 2012; Bates, 2000; DH, 2000). It is estimated that the cost incurred due to medication errors in NHS hospitals in the UK is between £200 and 400 million per year, however the costs to primary care services are not known (Smith, 2004). Medication safety experts suggest that many of these adverse effects such as patient morbidity, emotional costs to patients, family and healthcare professionals, and financial costs to health services are preventable and if errors are minimised many lives can be saved (Guwande, 2012; IOM, 2004; Bates, 2000; Bradley and Blenkinsopp, 1996).

In 2011, the WHO launched a patient safety programme which calls for all higher education institutions providing professional training to develop patient safety modules and incorporate these into their programmes (WHO, 2011). There have been a number of patient safety initiatives across the world and in the UK. The Scottish Government has adopted the Scottish Patient Safety Programme (SPSP) and medication safety is incorporated into the National Health Service (NHS). There are international, national and local medication safety guidelines in place (NMC, 2010; NHS Lothian, 2010; Smith, 2004).

Medication safety is a multi-disciplinary and multi-stage process, and nurses play a key role. While, the modern health services are becoming increasingly complex and nurses' roles are expanding. A number of medication safety experts have raised concerns about the lack of pharmacology education in pre-registration nursing education in the UK and also in Australia. This is perceived as being due to the shift away from the biological science model to the social science model of nurse education in the recent years. It is important for all health professionals, including nurses to have sufficient knowledge on pharmacology and sufficient clinical practice opportunities to manage patients' medications competently (Slater et al., 2012; Lymn et al., 2008; King, 2003; Bullock and Menias, 2002; Morrison-Griffiths et al., 2002).

This paper is based on an on-going action research project which examines the current medication management system and practice of two hospital wards and the pre-registration nursing education of medication management. Influenced by the Appreciative Inquiry (AI) approach in the health service research, it firstly identifies a range of excellent medication management practices in participating hospital wards. While highlighting areas that work well and that can be shared with other health services, it also explores areas that can be improved to ensure greater medication safety. Secondly, it highlights that whilst the traditional 'five rights' principles – right patient, right medication, at right time, via right route and right dose – are widely taught as the 'mantra' for medication administration safety during pre-registration nursing education and are adhered to by nurses during the administration stage, they do not provide holistic medication safety for all patients. The paper suggests, therefore, that a multi-disciplinary team work approach is required, which should look beyond 'five rights' and include nurses' involvement in medication reconciliation. Finally, for this to be achieved there is a need to incorporate holistic medication safety teaching, including dedicated hours of pharmacology sessions into the pre-registration nursing education curriculum and initiate continuing professional development (CPD) opportunities for qualified nurses working in hospital wards.

Research Method

Recognising the sensitive nature of the study topic this research adopts the Appreciative Inquiry (AI) approach in healthcare settings. AI was considered as an appropriate approach as it focuses on what works well, explores ways to bring positive changes and helps to build on positive ideas and images that emerge from healthcare professionals themselves (Richer et al., 2010). Within this framework, an ethnographic style observational study (Brewer, 2000), including qualitative interviews and group discussions, was chosen for this research. The diversity of healthcare professionals and nursing students' experiences provides in-depth rich data which enables the ethnographic researcher to capture the participants experience, cultures, environment, voices and insights. The major strength of the study was in it being a service led initiative in response to issues of medication safety, in partnership with three local Higher Education Institutions (HEIs). The field work was carried out between July and October 2012.

Fieldwork Setting and Research Participants

Primary research data was collected from two hospital wards in two different hospitals and three HEIs in Scotland. The two hospital wards were considered as discrete study units to understand the medication management system and everyday practices. These wards were chosen by an existing medication safety team within the NHS Board.

Data were collected by the participant observation (shadowing) technique, in which healthcare professionals – covering routine drug rounds from 8 am till 8 pm, including the weekend shifts – were shadowed to capture a wider picture of the medication management system and practices in hospital wards. Night shifts were also considered but not used as the medicine rounds predominantly occurred during the day shift. In both wards the researcher spent sixty three hours in total shadowing healthcare professionals, discussing ideas, and conducting formal and informal interviews. Clinical observation included shadowing nurses ($n = 20$), pharmacists ($n = 3$), pharmacy technicians ($n = 3$) and doctors ($n = 8$) in two participating wards. The researcher spent approximately an hour shadowing each nurse, pharmacist and pharmacy technician. This was followed by an informal

[4] In the TED (Ideas, Entertainment and Design - a set of global conferences) in Edinburgh, Scotland in 2012, TED is a global set of conferences owned by the private non-profit Sapling Foundation, formed to disseminate "ideas worth sharing." Information available at: http://www.ted.com/talks/atul_gawande_how_do_we_heal_medicine.html accessed on 14/8/2012.

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discussion with participants lasting approximately 20–30 min to further clarify areas which were not fully understood during the shadowing period. In addition to clinical observation, seven in-depth interviews were conducted with registered nurses (charge nurses = 4 and registered nurses = 3). The researcher also attended new staff induction sessions on medication management, Intra Venous (IV) therapy preparation training sessions for new nursing recruits and two new-staff induction sessions.

Information was also collected from the final year nursing students in three HEIs using two focus group discussions ($n = 11$; $n = 8$) and one peer-discussion ($n = 2$). All group discussions were facilitated by the researcher and discussions were recorded. All participants were female. There was no apparent dominant individual in the group and all participants took part reasonably equally in the discussion. The purpose of this was to explore the nursing students' understanding of medication safety and to determine their further educational needs, in order that they are better prepared to fully participate as registered professionals after graduation.

The two wards under study had many similarities as well as differences. Ward A was a small, 16 bedded medical admission unit which came under the Care of Elderly Medicine Directorate and Ward B an acute surgical unit, coming under the Surgical Directorate. Both wards had rapid patient and staff turn-over. Other similarities included nursing staffs' shift patterns (12 h), regular input from the pharmacy staff, medical doctors' presence and clinical placement facility for pre-registration nursing student from local HEIs. Also, there were marked differences between these two wards, including the type of patients admitted, nature of illness conditions, working environments, ward routines and type of commonly used medication in the wards which all have implications on pre-registration nursing students learning about medication safety.

Ethical Consideration

Ethical approval was obtained from the local NHS ethics committee, two participating wards and from all of three partner HEIs. Healthcare professionals working on these two wards, and final year nursing students were invited to participate in this study and their participation was voluntary. All participants who volunteered for in-depth interviews and focus group discussion signed an individual consent form and other staff members whom the researcher shadowed gave verbal consent to do so. Participants had the option to withdraw if they felt uncomfortable or for any other reason. During the process of shadowing healthcare professionals on both wards, the researcher tried to remain as non-judgemental and non-intrusive as possible. The study wards, and individual professionals involved in this study are anonymised to protect their identity.

Data Analysis

Data were analysed using a qualitative analytic method, primarily consisting of reading and rereading of ethnographic field notes, interviews and focus group transcriptions, producing analytic memos and building analytic themes and insights (Silverman, 2012).

Study Limitations

The study provides a snap-shot of the medication management system and practices in two wards (out of over 160 wards within the NHS Board). High staff turn-over, and changing healthcare environments mean information presented here can be quickly superseded. It is important to note that there have been some changes in the pre-registration nursing curriculum in 2013 in all participating HEIs, so that students who go through this new curriculum may have different learning experiences to those who participated in this study.

Results

An Overview of the Medication Management System and Practices in Two Participating Wards

This paper illustrates two main aspects of medication safety practices in a Scottish Health Board and three local HEIs: firstly current medication safety practices in two clinical settings and secondly pre and post-registration nursing education and teaching on medication safety. As this paper is based on an observational study, findings presented here were witnessed and charted by the researcher during clinical observation and interaction with diverse healthcare professionals.

The current policy of the NHS Board studied was that when new patients came to hospital wards they were encouraged to bring their own medication if they were taking any regular medication at home. The idea behind this was to reduce medication error risks and wastage. Patients' medical records were checked and medications were prescribed by the admitting doctor. Accuracy of these medications was suggested to be verified by at least two sources; the patient themselves (if they were well enough), the medical records and the medication patients bring with them or from relatives. This process was called 'medicine reconciliation' and aimed to make the transition smooth and to ensure all patients' medications were prescribed correctly and appropriately.

The clinical pharmacists were directly involved in the medicine reconciliation process in both participating wards which was a relatively recent practice. They were involved in screening medication charts, double-checking patients' medical history and in making decisions on choice and suitability of medication for a particular illness condition. During the clinical shadowing process, the researcher noted that ward pharmacists were discussing medication details with medical doctors and microbiologists to determine the suitability of certain antibiotics for certain conditions. Pharmacy technicians were involved in screening Medication Record Charts (MRCs) for appropriate prescribing, dispensing and storing patients' medication. All these steps of medication management were observed during the ethnographic observation on two participating wards.

Ward stocks and patients' own drug stocks were checked regularly and the researcher noted that there was generally enough supplies for the patient while they were in hospital and also to take home when they were discharged. Most health care professionals the researcher interacted with on the wards suggested that pharmacists and pharmacy technicians played a critical role in medication safety. Their role was perceived as invaluable for the new system of screening MRC and supplying enough medication to patients, saving nurses' time as patients drugs would be ready to take home when discharged and promoting safety.

With regard to the medication administration practices, there had been some important local changes all of which were intended to improve medication safety. As widely discussed by medication safety experts, the NHS Board had recognised distraction and interruptions during the drug round as being a contributing factor to medication errors (Westbrook et al., 2010; Choo et al., 2010; Bullock and Menias, 2002). To minimise interruptions and distraction during the drug round new practices such as nurses wearing tabards (special vests to alert other team members and visitors not to distract nurses from their task) had been introduced in both wards and this was widely practised in the hospitals. Telephone calls during the nurses' drug round were also perceived as an interrupting factor in Ward B. About a month before the study started, Senior Charge Nurses organised the phone calls to be diverted to the ward secretary during the busy hours of the morning drug round.

Patients' medications were kept (locked) in individual patients' bedside lockers. It was reported to the researcher by ward staff that the medication storage system had greatly improved since the introduction of this system. Other changes included the modifications of the timing of the drug round. For example, nursing staff who were involved

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in this study suggested that several years ago, on Ward B, night nursing staff used to do an eight am drug round before they finished their night shifts. But as nurses' tiredness at the end of a long-shift has been perceived as one of the contributing factors for medication errors (Westbrook et al., 2010; Unver et al., 2012), this practice changed. During the research period (and continued afterwards) nurses on the morning shift did the eight am drug rounds and it had been found effective.

Other ward level improved practices (as reported by the nursing staff) included preparation and administration of intravenous (IV) antibiotic therapy. Until a few years ago IV drug preparation, administration and checks for the above mentioned 'five rights' was done by one nurse. Recognising the higher risk associated with IV therapy (Taxis and Barber, 2003), the process, at the time of the study was completed by two competent nurses who have had IV therapy competency training.

This IV therapy competency training session was perceived as extremely valuable by many newly qualified nurses, as they did not usually get IV preparation and administration opportunities in their pre-registration education. After attending a session on IV preparation and administration for all new employees, a recently qualified nurse stated "*now I feel like a real nurse*".

Medication Safety Learning Experience of Nursing Students

Clinical learning for all healthcare professionals starts from the earliest stage of their professional education. For nursing students too, learning about medication management starts from the first year of pre-registration education. Final year nursing students who took part in this research reported that they were gently introduced to a basic understanding of some medications in the first year of the education programme. They were then gradually exposed to clinical practices of administering medication from the second year onwards with their programme aiming to provide basic competency to manage medication by the end of their pre-registration education.

While discussing the level of pharmacological understanding, less experienced and final year nursing students expressed the concern that they had limited knowledge in this area, had insufficient understanding of how different medications work in the human body, and lacked confidence. For this reason too, professional nurses need to have enough pharmacological knowledge. Without this understanding they are not fully prepared to deal with adverse events, including monitoring patients' conditions.

The need for a compulsory medication safety modules including, dedicated hours for pharmacology sessions for nurses working within multi-disciplinary teams to promote greater patient safety has been recognised by medication safety experts (Armitage et al., 2011; Westbrook et al., 2010; Bullock and Menias, 2002). Nursing students who participated in this study suggested that they were taught to follow the traditional 'five-rights' principles for administration safety and were assessed for numeracy and drug calculation skills throughout their education period. They also indicated that they had varied levels of learning experience and clinical exposure in pharmacology and medication safety. Focus group discussions with final year nursing students, and informal discussions with newly qualified nurses revealed that they felt that they would like more learning sessions on medication management and applied pharmacology. Here are some statements from focus group discussions.

> …just some common kind of drugs, we do not do this [get lecture on drugs] as a student, and suddenly one day, you are a staff nurse and are accountable for (FGD #1).

Another student expressed her view this way:

> …in university like, more in-depth education on drugs: what they for, how they work and contraindication, sometimes you have do things like check pulse before giving medication, etc. [is needed] (FGD #2).

Most students from informal discussion and in-depth interviews expressed very similar views on their learning experiences on medication management and pharmacology.

Newly qualified nurses also expressed their concerns about their lack of knowledge of pharmacology. Their suggestions to enhance pre-registration education included more training on drug groups, poly-pharmacy, drug side effects, and contraindication, additional drug round opportunities during clinical placements, and regular CPD sessions after graduation.

Discussion

Recent Policy and Practical Changes in Medication Safety in the UK

Recognising the importance of medication safety in an increasingly fast-moving and challenging modern healthcare system, since 2000, there have been phenomenal national and organisational level changes across the NHS in the UK. These changes are charted in a series of reports. The Department of Health (DoH, 2000) produced a document called "An Organisation with a Memory" that recognised the need for health services to learn from adverse incidents in the NHS. This document focused on building safer systems by moving beyond blaming individual practitioners, and stressed medication safety as one of the priority areas for patient safety. A few years later, another guideline called "Building a Safer NHS for Patients, improving medication safety" was published by the DoH (Smith, 2004). The purpose of this guideline was to make the NHS in the UK a safer place for patients and healthcare professionals to work and following on from its publication some other significant changes have been made. Within this context, healthcare professionals' roles and working patterns/hours have been changed (with European Working-time Directives). Junior doctors and nurses working hours have been reduced to a maximum of 48 h per week (SEHD, 2006). In line with UK wide changes, as noted above, there have been local changes too, specifically with regards to medication management.

Close examination of the UK-wide system of medication management, through prescribing, ordering, dispensing and storing, administering, recording, reporting and disposing of medication and medical products, reveals that guidelines are reviewed and updated regularly by national and local health authorities. Many of the changes in clinical practice are (or claim to be) evidence-based. The selection of specific drugs to prescribe for health conditions is based on the national and local NHS Trust/Board level guidelines. These guidelines are recommended by the National Institute of Clinical Excellence (NICE). These are dependent on the availability and affordability to the NHS of particular types of drugs in the UK.

As noted above, medications of various forms are handled by a chain of professionals. Doctors, pharmacists and registered nurses all make important links in the medication safety system in most healthcare settings. Firstly, patients' medications are usually prescribed by trained doctors, then dispensed by pharmacists, and finally administered to patients by registered nurses. The final and most important defence link in the medication management system is nursing staff; they are involved in administering medication (Westbrook et al., 2010; Johnson et al., 2011). They have important training and educational needs which have been noted above.

'Five Rights' and the Medication Administration Safety

Medication safety practice which is commonly known as the 'five rights' principle is usually followed by nursing staff during the administration stage to avoid medication errors (Banning, 2003; Choo et al., 2010). But, recognising today's rapidly changing and complex environment, we argue that there is a need for nurses to go beyond the 'five rights' to ensure holistic medication safety. We outline two main reasons why.

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Firstly, if we look at various stages of medication management individually, starting with prescribing which includes medication reconciliation, this has been widely recognised as an area that needs greater attention for medication safety in the UK and globally (Choo et al., 2010). During the shadowing process the researcher also noted that experienced nursing staff who provide the final defence to medication safety, were vigilant about prescriptions, and they were found to be regularly seeking out doctors and pharmacists to deal with prescribing issues. However, these skills are acquired with long-term work experience. The final year nursing students and newly qualified nurses were not fully prepared to appreciate the importance of medication reconciliation and team work. Findings from this study suggest that multi-stage and multi-disciplinary medication management education has not yet, been fully incorporated in to all pre-registration nursing education curricula.

Secondly, there is an increasingly improved choice of medicines available in the health service today, and many people with illnesses are exposed to poly-pharmacy and its potential problems (Martin, 2007). Monitoring adverse effects of drugs is vital. Drugs do interact with each other and nurses and other healthcare professionals are responsible for knowing, recognising and managing different types of drug interaction. While 'five rights' are absolutely fundamental guidelines for administration safety, we stress that these do not cover the whole spectrum of medication safety. The need for nurses to learn applied pharmacology in order to undertake multi-skilled professional roles has already been highlighted (Sulosaari et al., 2010; Banning, 2003).

Multi-disciplinary Team Working Towards Greater Medication Safety

After highlighting the complexity around medication management in modern healthcare systems we propose some important educational and policy recommendations. These include, as well as 'five-rights' principles, nurses need to be fully involved in the medication reconciliation process. Modern nurses are not only expected to administer drugs but they take increasingly multi-skilled professional roles (Corcoran, 2010; SEHD, 2006; Banning, 2003). Nurses are with patients on the ward 24/7. Nurses can obtain a comprehensive picture of patients' medical and medication history. Nurses also need to be equipped with the necessary knowledge of pharmacology and the medication reconciliation processes. The importance of multi-disciplinary working has to be valued by healthcare managers and professionals.

As well as nurses' involvement in medication reconciliation, health professionals participating in this study suggested that there is a need to have additional pharmacy input on the ward. Pharmacists suggested that ideally, they aim to screen all patients' MRCs within 24 h of admission, so that patients do not miss out any important drugs. This seems to be an excellent effort, but because of the shortage of pharmacists, this has not been always possible, particularly when regular pharmacists are on annual leave. The need for more pharmacy input in medication safety has been highlighted by the former Scottish Health Secretary Nicola Sturgeon (STV News, 2011).

Implications for Nursing Education

From discussions with final year nursing students and newly qualified nurses, it became very clear that they are keen to gain more pharmacology knowledge and more exposure to the medication management processes during their pre-registration clinical placements. A number of research papers have also highlighted the need for dedicated pharmacology sessions during pre-registration nursing education (Sulosaari et al., 2010; Bullock and Manias 200; Morrison-Griffiths et al., 2002). This paper has clearly illustrated that this study has major implications for informing nursing curricula to include providing comprehensive medication management and pharmacology sessions in pre-registration nursing education.

Also, as has been suggested by nurses themselves during discussion in the clinical settings they need to develop greater understanding about the whole system of multi-disciplinary medication management including the medication reconciliation processes. Newly qualified nurses felt that there was a need for more rigorous CPD sessions for all nursing staff in the medication safety area to remain up-to-date with the latest developments around medication management.

Conclusion

Medication safety has become a major patient safety concern globally. Various medication safety policies have been developed and new initiatives have been implemented to reduce medication errors. Some of the main policy initiatives involve the use of modern technologies, and the development of inter-professional learning curricula to improve patient safety and these initiatives have been found to be effective in reducing medication errors in hospitals (Bates, 2000; Choo et al., 2010; Slater et al., 2012).

The current medication management systems, in the NHS hospital wards under study, have put various safety mechanisms in place. Medication reconciliation, increased pharmacists' input in the medication reconciliation process, various policy and practical efforts such as nurses wearing tabards during administration to reduce distraction, double safety checks while administering IV medication and a medication safety awareness programme are just a few examples.

This paper has also highlighted that there are some areas that can be strengthened. We have suggested strategies such as a multi-disciplinary approach to medication safety including medication reconciliation. As Armitage et al. (2011) suggest medication safety is a multi-disciplinary business that requires multi-disciplinary management effort. Also, important issues such as nurses requesting (and needing) more pharmacological knowledge need to be addressed by HEIs and NHS employers. There is a necessity to equip nurses with sufficient and dedicated hours of pharmacology teaching during their pre-registration education and continuing professional development opportunities on medication management.

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