

Nurses' experiences and perspectives on medication safety practices: an explorative qualitative study

MARIAN SMEULERS MSc¹, ASTRID T. ONDERWATER MSc², MYRA C. B. VAN ZWIETEN PhD³ and HESTER VERMEULEN PhD^{4,5}

¹Quality Advisor and Researcher, ²Researcher, ⁴Senior Researcher, *Department of Quality and Process Innovation (KPI), Academic Medical Centre, University of Amsterdam*, ³Assistant Professor, *Department of General Practice/ Medical Ethics, Academic Medical Centre, University of Amsterdam*, and ⁵Associate Professor, *Amsterdam School of Health Professions, Amsterdam, The Netherlands*

Correspondence

Marian Smeulers
Department Quality Assurance
and Process Innovation (A3-503)
Academic Medical Center
Meibergdreef 9
P.O. box 22600
1100 DD Amsterdam
The Netherlands
E-mail: m.smeulers@amc.nl

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Aim To explore nurses' experiences with and perspectives on preventing medication administration errors.

Background Insight into nurses' experiences with and perspectives on preventing medication administration errors is important and can be utilised to tailor and implement safety practices.

Methods A qualitative interview study of 20 nurses in an academic medical centre was conducted between March and December of 2011.

Results Three themes emerged from this study: (1) nurses' roles and responsibilities in medication safety: aside from safe preparation and administration, the clinical reasoning of nurses is essential for medication safety; (2) nurses' ability to work safely: knowledge of risks and nurses' work circumstances influence their ability to work safely; and (3) nurses' acceptance of safety practices: advantages, feasibility and appropriateness are important incentives for acceptance of a safety practice.

Conclusions Nurses' experiences coincide with the assumption that they are in a pre-eminent position to enable safe medication management; however, their ability to adequately perform this role depends on sufficient knowledge to assess the risks of medication administration and on the circumstances in which they work.

Implications for nursing management Safe medication management requires a learning climate and professional practice environment that enables further development of professional nursing skills and knowledge.

Keywords: medication errors, nurses, nursing process, quality improvement, safety management

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Introduction

Medication safety is important because medication errors (MEs) are the most common type of medical

error and are associated with considerable health care expenses (Bates *et al.* 1997, Committee on Identifying & Preventing Medication Errors 2007). A ME is defined as 'any preventable event that may cause or lead

to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient or consumer' (NCCMERP 2012). Estimates of the incidence of MEs vary between 5% and 25% of all medication administrations (Barker *et al.* 2002a, Committee on Identifying & Preventing Medication Errors 2007, Krahenbuhl-Melcher *et al.* 2007, Hughes & Blegen 2008). One-third of all MEs that cause harm to patients arise during medication preparation and administration (Leape *et al.* 1995, Barker *et al.* 2002b, Fijn *et al.* 2002). These medication administration errors (MAEs) occur when one or more of the seven rights of medication administration (right patient, right drug, right dose, right time, right route, right reason and right documentation) are violated (Wakefield *et al.* 1999, Pape 2003). The medication administration process is error-prone because of the many environmental and workload issues encountered by nurses (Pape 2001, Mayo & Duncan 2004, Tang *et al.* 2007, Armutlu *et al.* 2008, Brady *et al.* 2009). However, nurses are in a key position to identify, intercept and correct errors before they affect patients (Henneman *et al.* 2010). Evidence indicated that nurses were responsible for 86% of all ME interceptions, regardless of the error origin (Leape *et al.* 1995). MEs are also used as a nurse-sensitive indicator of quality and safety of care (Burston *et al.* 2013).

Given the high number of MAEs, many practices have emerged in the past decade to increase the safety of the medication administration process. These practices include e-learning, medication education, protocols and visual reminders, double checking, dedicated medication nurses, interruption protection, and electronic systems (Hodgkinson *et al.* 2006, Jones 2009, Poon *et al.* 2010). The evidence of effectiveness of these practices is generally weak, with bar-coded medication administration being promoted as the most effective method for reducing MAEs (Ioannidis & Lau 2001, Hodgkinson *et al.* 2006, Poon *et al.* 2010, Raban & Westbrook 2013). Although high-quality evidence is limited, these practices are being increasingly incorporated into hospital policies. Nevertheless, nurses' adherence to safety practices is a problem (Armitage & Knapman 2003, Hughes & Blegen 2008, Gill *et al.* 2012, Kim & Bates 2013, Raban & Westbrook 2013). Little is known regarding the experiences and perspectives of nurses in the prevention of MAEs and the application of safety practices. Knowledge of these experiences and perspectives is important for tailoring safety practices to experienced barriers and facilitators and realising an adequate level of implementation. Therefore, this study aimed to

learn more about nurses' experiences with and perspectives on preventing MAEs.

Methods

Setting and context

The study was conducted at the Academic Medical Center (AMC), a tertiary care university hospital in Amsterdam, The Netherlands. Each 30-bed ward has a medication room where medications are stored and prepared for administration by nurses. Physicians prescribe the medication through an electronic prescribing system. All prescriptions and administrations are documented in a paper-based medication administration file. Each nurse has designated patients for whom he/she prepares and administers medications.

Participants

We performed a qualitative exploratory study in nurses. To obtain a broad perspective on the subject from the management as well as the operational level, purposive sampling aimed at a high level of heterogeneity was utilised. Initially, nursing managers, their quality and safety innovators, and nursing ward managers were approached by e-mail by the two researchers, with requests to participate in a study on practices to improve medication safety. Snowball sampling was then used to obtain the names of other nurses from different departments, representing different levels of training and seniority as well as varying attitudes towards medication safety practices. To be included in the study, participants were required to be registered nurses. All nurses were requested by e-mail to participate. This process continued until saturation was reached.

Data collection

Semi-structured individual interviews ($n = 20$) were conducted by M.S. and A.O. between March and December 2011, with each interview lasting approximately 60–90 minutes. The semi-structured interviews allowed the participants to speak freely with structured guidance from the interviewer using a topic list. The topic list was based on literature by Grol, which states that when planning changes in clinical practice, potential barriers and facilitators regarding the nature of the innovation; characteristics of the professionals involved; and the social and organisational context need to be addressed (Grol & Grimshaw 2003, Grol & Wensing 2004). The initial topic list was narrowed

in scope twice after collecting and analysing the data from 9 and 12 interviews (Appendix S1). Towards the end of the interview, the participants were asked to reflect on various safety practices (Appendix S1). All participating nurses received an email explaining the purpose of the interview, the guarantee of anonymity and the possibility to refrain from participation at any time. Participants were reassured that the aim of the study was to obtain the nurses' personal perspectives and opinions on, as well as their experiences with, medication safety policies and practices and not to evaluate the department. The interview process was explained and written informed consent was obtained from all participants. With the nurses' consent, the interviews were recorded and transcribed verbatim.

Data analysis

Data analysis was performed in parallel with the interviewing process by M.S. and A.O., according to guidelines for qualitative research and using MAXQDA10 software (Boeije 2008, VERBI software 2010). The interviews were coded independently after each interview, and codes were compared and discussed until consensus on a coding tree was reached. Coding and consensus meetings were performed iteratively for the first 15 interviews, and coding of the remaining five interviews was divided, with one author coding and the other author reviewing. Through consensus meetings, the most relevant themes related to nurses' experiences in and perspectives on preventing MAEs were identified. Finally, the text fragments were sorted and analysed according to the identified themes. The other two co-authors verified and supported the process and peer-reviewed the results.

Results

In total, 20 nurses were approached, and all participated voluntarily. There were 15 females and five males, with a mean age of 43 years (range 27–61) representing nurses with different experience levels: nurse directors ($n = 2$), nurse quality innovators ($n = 2$), nursing ward managers ($n = 3$), senior nurses ($n = 5$) and regular nurses ($n = 8$). Of the participating nurses, only senior and regular nurses were directly involved in medication preparation and administration.

Three specific themes emerged from the analysed material: (1) the nurses' roles and responsibilities in medication safety, (2) the nurses' ability to work safely in daily practice and (3) the nurses' acceptance of safety practices.

Nurses' roles and responsibilities in medication safety

Nurses feel responsible for safely preparing and administering medication, but they also feel they have a role in the constant assessment of a patient's condition in relation to the medications prescribed. This role is expected of them, and they are appreciated for it.

Nurses' strong feelings of responsibility

All of the nurses felt responsible for their patients and for the medications they administer. Many nurses indicated the importance of being alert and of working precisely when handling medication.

'You just have to look carefully, you always have to look carefully on the medication order, what it says, what is prescribed, what dosage for which patient'. (WN15¹)

'Concentration is very important; to concentrate on what is on the prescription, what you are getting from the drawers, so that you can work uninterrupted'.

Some nurses mentioned that they feel very responsible because they are the individuals who administer medications but that this responsibility also makes them feel vulnerable because they feel personally responsible for MEs. (WN14)

'Medication is something people are afraid of making mistakes with, afraid to give the wrong medication; afraid to be held accountable for. The biggest fear is to give something that kills someone. You don't want that on your conscience of course'. (WN17)

Nurses' pivotal role

In addition to working precisely with medications, nurses consider that they play a pivotal role in the medication process and, consequently, in medication safety. Although the physician is responsible for prescribing medications, the nurses indicated that clinical reasoning is expected of them; they check the prescribed medications thoroughly and evaluate the prescribed medications in relation to the actual condition of the patient. In addition, they mentioned that the physicians appreciate them for taking on this role.

¹WN = ward nurse (senior nurses and regular nurses), NS = nursing supervisor (nurse directors, nurse quality innovators and nursing ward managers).

'But also the clinical reasoning, if a patient is hypotensive and you as a nurse are just giving the medications groundless, than you cannot give full responsibility for that to the physician just because a patient's vitals are incidentally different'. (WN14)

'Sometimes patients have low blood pressure and we still have the prescriptions for medications to lower the blood pressure. It is our task, that we should see that a patient has a low blood pressure, should we give the blood pressure reducer. But sometimes it does go wrong, and a patient ends up in ICU because a nurse didn't see that.and yes that is difficult because where does our responsibility for a task end?' (WN20)

'I think that the nurse as well as the physician should look at things like: I see that patient still takes three pain medications, is that still necessary? Or also with medications that was temporarily stopped. Those are usually the more experienced nurses that say that'. (WN20)

This expectation is also endorsed by the nursing supervisors.

'I think people have to think for themselves, if a patient is vomiting there is a big chance the medications will not work, then I expect the nurse to consult the physician. So I think in that respect they have to think along and not just give a medication because the prescription says so'. (NS3)

'You have to think, even if you work here for 30 years and you have a prescription, you have to think and know that if is right, if it is the appropriate dosage, you need to have that knowledge and if you don't know you have to look it up and consult the physician'. (NS18)

Nurses' ability to work safely

The ability to work safely with medications is influenced by (a) the awareness of the risk of an error and (b) the circumstances in which the nurses work.

Risk awareness

Awareness of the risk of MAEs varies among nurses. They derive their awareness from knowledge of the consequences of an error, incident reports and personal experiences. Some nurses indicated that errors may occur because of a lack of knowledge or experience.

'I think people always have the intention to provide optimal care, and also deal with medication optimally. But you don't know what you don't know, that kind of mechanisms will be of influence, I guess. You trust your own knowledge; your own experience, on what you see' (NS16)

Knowledge of the consequences of an error appears to determine the perceived risk of a medication administration. Nurses consider factors such as the route of administration, the characteristics of the medication itself, and the combination of the medication and the condition of the patient. In general, intravenous medications are perceived as being more risky than oral medications because they have direct consequences and are more difficult to correct than oral medications.

'A mistake with oral medication is...well that feels less serious than injections. All medications that you give through an infusion or injection generally work very fast, so you have limited options to correct'. (WN17)

'Well, for example if my colleague wants to give an opiate or if someone has cardiac problems and we have to give something intravenous, then we always perform a double check together'. (WN5)

When the nurse is aware of the potential larger consequences for a patient, he/she is more likely to call a physician with questions and suggestions regarding the medication policy. In these situations, nurses are less inclined to take personal responsibility regarding risks.

If the risk is perceived to be high, there seems to be more incentive to be absolutely certain that medication is precisely administered. In situations that clearly involve high-risk medications, protocols and guidelines are strictly followed and accepted as being self-evident. However, some nurses mentioned that it is not always clear which medications are considered 'high risk'.

'A protocol is an agreement that has been made and you have to follow it at all cost I think, especially with chemotherapy, that really is sacred here on our department, it has the highest priority to give it exactly in time and to make as few mistakes as possible with it'. (WN15)

'We do have a short list here of medications that we have to double check. And that list was once

made, based on, well, I guess, the fact that those are risky, but I couldn't tell if that was actually written down somewhere'. (WN11)

'When I have to give epidural or cardiac medications, where I think it is important medication, then I let someone else check it. This gives me a feeling of safety'. (WN20)

Forgetting medications or administering medications too late was perceived to be a problem for some medications but not for other medications.

'I think there is a difference, if I forget to give a paracetamol, I think that is less bad than if I do not give enough chemotherapy; these of course are two extremes. A paracetamol can also be important for some patients here, but some medications are more important than others, if a patient is on antibiotics for prophylaxes and I forget it, it is not so bad, but if the patient already has a fever and you forget to give it, yes then it is bad'. (WN15)

The nurses mentioned that when an error or incident occurs, additional awareness of the risks of medication administration is created. This awareness may (temporarily) lead to more attention to or a sense of urgency for safe working conditions and facilitate quality improvement initiatives. This attentiveness also occurs if there are many incident reports on the same subject.

'Who guarantees you have the right settings on a pump, maybe you put in a zero too much. Those are things that have happened. And when they happen, there is extra alertness again'. (WN10)

Circumstances

Work pressure, nurses' work environment and the dependency of others influence nurses' ability to adequately perform their role. Most nurses indicate that high work pressure or multitasking sometimes hampers their ability to work safely, possibly resulting in a lack of concentration and hurried work. In these situations, if the perceived risk is not high (no harm or consequences for patient treatment), nurses sometimes decide not to work according to the established safety practices.

'The one moment where it sometimes goes wrong is when it is busy, because you need a double check and you can't find anyone. Then, sometimes you make the consideration; 'OK what is the risk if I

don't do the double check?' And sometimes I choose to do it alone'. (WN17)

'A mistake was made, that someone connected morphine to an epidural. Actually you should connect all syringes together, but that just is not feasible. If you have ten patients in the night shift that are on pain medications and the pump starts to beep and your colleague is changing a bed, then you just can't check together'. (WN6)

To cope with work pressure, different nurses mentioned that they, or their colleagues, apply individual efficiency practices, such as preparing in advance or dispensing multiple medications for multiple patients at once, even although they are aware that these practices may introduce a risk of errors.

'Well I think it is safer to go with one dispenser at a time to your patients, but yeah, that is not efficient'. (WN17)

The environment in which nurses prepare medications also influences medication safety. Owing to the fixed medication rounds, everyone enters the medication room at the same time, thus causing a busy, hectic environment that most nurses consider disturbing. They feel tranquility and concentration are needed when preparing medications.

'There is a lot of turmoil in the medication room. I mean if you are working with five nurses during the day and there are eight students present as well, and they all have to prepare medications, then it's a henhouse, that doesn't work'. (NS4)

'In our medication room there still is too much rumor and not enough rest which causes people to be distracted. That is error prone, it just isn't right'. (WN10)

Several nurses indicated that they have no problem with the hectic environment. In addition, the extent to which nurses dare to give feedback to colleagues regarding distractions differed.

Various nurses mentioned that the medication process is error prone owing to the complexity of the process and the interdependencies with other disciplines.

In general, nurses perceive their collaboration with the physicians as good; however, obtaining the documented prescriptions is often delayed, and the nurse needs to start administering the medication to the patient to ensure medication continuity.

‘And then we do not have the prescriptions. What do we do? We give the medications, because we cannot wait until a physician is going to go print the prescriptions. And if you are talking about safety, actually we are doing things, we are not allowed to’. (NS3)

All of the nurses experienced the documentation and processing of prescriptions as being particularly error prone.

‘The printed sticker depends on the nurse to stick it in the right place in the right file of the right patient. That of course is a risk, there mistakes happen’. (WN14)

Many nurses experience difficulties in the delivery of medication from the pharmacy, which may be because of a delay or an inability to deliver the medication. To avoid this problem, nurses often continue using the medication the patient brings in after being admitted or may ‘shop’ in other departments to obtain the medication.

‘Well the pharmacy has limited timings to acquire medications, so if a patient is admitted in the evening, you just have to figure out where you are going to get the medications from’. (WN14)

Positive remarks from the nurses regarding the pharmacy department were that they are able to obtain the pharmacy’s advice regarding the dosing and interactions of medications as well as protocols for medication preparation.

Nurses’ acceptance of safety practices

The nurses mentioned several characteristics of safety practices that are important for their acceptance and implementation. All of the nurses indicated that (a) it is important that a safety practice actually improves patient safety and is preferably evidence based. However, several nurses mentioned that a practice can and may be based on common sense and that scientific evidence is not always necessary.

‘People have to feel that it has an advantage and that it contributes to the safety of the patient. I think that is what motivates nurses’. (WN14)

‘Well I really think that an innovation should have advantage with respect to the current situation, but it also should have a clear effect and be evidence-based’. (WN11)

Aside from a clear advantage, many nurses indicated (b) the importance of being consulted on the feasibility

of a new practice before it is implemented. Some of the nurses indicated that the advantage of a practice sometimes only becomes clear to them once the practice has been implemented for a while. Errors that otherwise would have remained undetected become visible, and performing the practice is less of a burden than initially expected. Therefore, evaluation of the practice after a period of time is considered important.

‘People find it important to give their input, to try things out and then evaluate and see how it goes’. (WN14)

Finally, several nurses indicated that it is also important that (c) a practice is appropriate and feels comfortable. Although many nurses indicated that interruptions and distractions are a problem, the practice of wearing ‘do not disturb’ tabards during a medication round is not unanimously embraced because of personal barriers and a lack of convincing evidence of effectiveness.

‘Well, those “do-not-disturb” tabards, they are awful, I saw those. I don’t think that it is going to work. I think everybody is going to think it is ridiculous, after all we are talkative people’. (WN6)

‘Do-not-disturb tabards, yes I think it is a good idea during the medication round. I believe for sure it will work, it looks awful, but it is very clear’. (WN10)

Discussion

Main findings

Nurses play a pivotal role in medication management and safety, which extends beyond a responsibility for just preparing and administering medications as prescribed. Nurses coordinate the delivery of care and have the closest interaction with patients, which enables them to assess the condition of the patients in relation to the medications that are prescribed. Other studies also identified nurses’ clinical reasoning and coordination of care with physicians and pharmacists as being essential for safe medication administration (Eisenhauer *et al.* 2007, Popescu *et al.* 2011, Dickson & Flynn 2012). However, it is sometimes not clear where their responsibility ends.

This uncertainty indicates the need for strengthened multi-disciplinary teamwork and a shared responsibility to achieve greater patient safety. To accomplish this goal, nurses need to have sufficient knowledge of medication safety issues. Knowledge of the risks

associated with medication administration appears to influence the perceived need to apply safety practices in daily work. This is also evidence from other studies stating that to avoid errors, adherence to a medication administration protocol is more likely when the drug to be given is perceived as high risk, is unfamiliar, or is required by law to be double checked (Davis *et al.* 2005, Manias *et al.* 2005, Armitage 2007, Gill *et al.* 2012). However, consensus on which medications are high risk and/or which patients in certain clinical situations require additional safety practices is needed to equip nurses with sufficient knowledge to adequately perform their role (Institute for Safe Medication Practices 2012, Maaskant *et al.* 2013). The quote on anti-hypertensive therapy from the interviews is a good example of a clinical situation where active monitoring of vital signs of the patient is required owing to the nature of the administered medications (Harvey & Jordan 2010). This knowledge is also important for the uptake and implementation of safety practices because the perceived advantage is an important incentive to adopt and apply a practice (van Noord *et al.* 2010, van der Voort *et al.* 2012). These findings indicate that in order to prepare and enable nurses to be leaders in medication management, more attention is needed to improve basic as well as continuing education on medication safety (Gabe *et al.* 2011). Nurses need to be educated with adequate theoretical knowledge of pharmacology in the teaching curriculum as well as on how to use this knowledge for clinical reasoning. Case-based teaching, for example promotes acquisition of knowledge from experience and it promotes critical thinking (Hughes & Blegen 2008, Adhikari *et al.* 2013, Vaismoradi *et al.* 2013). Simulations of medication administration and errors in a controlled setting are another possible educational strategy that could be used to prepare nurses to recognise and manage medication errors when and if they occur (Hughes & Blegen 2008). Also more active involvement of clinical pharmacists in the ward enables inter-professional collaboration and provides opportunities for case-based teaching and knowledge sharing through involvement in protocol development (Kaboli *et al.* 2006, Klopotoska *et al.* 2011, Gillespie *et al.* 2012, Adhikari *et al.* 2013).

However, it is also clear that even if the advantages of a certain safety measure (e.g. double checking) are evident, the measure is sometimes not feasible in daily practice (Fogarty & McKeon 2006, Popescu *et al.* 2011). Work pressure, the practice environment and the dependency of others influence nurses' ability to adequately perform their role. These circumstances, in

combination with the perceived risk, appear to determine whether nurses adhere to safety practices. Applying a standard medication room and creating more awareness of the risks of interruptions can improve environmental aspects of safe medication administration (Rozenbaum *et al.* 2013). Also process-improvement methods, such as Lean Six Sigma, that aim to reduce unnecessary variation and eliminate waste may also be of interest for addressing this problem (Elganzouri *et al.* 2009, Aboumatar *et al.* 2010, Conrad *et al.* 2010, Newell *et al.* 2011). A recent study in which six safety practices were implemented using a Lean Six Sigma approach demonstrated a substantial decrease in medication administration errors (Ching *et al.* 2013, Rozenbaum *et al.* 2013).

Finally, on many occasions, the nurses stated that the system does not adequately support them, which can lead to errors and additional time-consuming procedures. Computerised medication systems are a promising development, as it has been demonstrated that these systems can improve the medication administration safety by combining patient data from electronic medical records with trigger tools that alert the nurse to high-risk situations, as well as by bar-coding medication administration as a final check before actual administration (Hodgkinson *et al.* 2006, Choo *et al.* 2010, Poon *et al.* 2010, Newell *et al.* 2011, McDonald *et al.* 2013, Nwulu *et al.* 2013).

To improve the safety of medication administration, the acknowledgement and facilitation of the pivotal role of the nurse by nursing management are important. This notion is also endorsed by growing evidence of the organisation of nurses and the manner in which care is provided as critical factors for positive patient safety outcomes in hospitals. Nurse-related factors such as staffing, education, collegial relations with physicians and transformational leadership have all been shown to affect patient safety outcomes (Duffield *et al.* 2011, Clavelle *et al.* 2012, Dubois *et al.* 2013, Smeds *et al.* 2013, Wong *et al.* 2013). In such a professional practice environment, nursing is recognised as a professional discipline with a rich skill mix and high staffing intensity. The practice environment is more supportive of professional practice, with greater investments in innovation and education. High levels of trust in management also seem to encourage nurses to employ practices that intercept errors before they reach the patient and to deliver a higher quality of nursing care (Vogus & Sutcliffe 2011, Flynn *et al.* 2012). This trust is also advocated through the seven driving factors for patient safety: leadership, evidence-based practice, teamwork,

communication, and a learning, just and patient-centred culture (Burston *et al.* 2013).

Strengths and limitations

The qualitative design of this study provided the opportunity to explore a complex topic. Through the in-depth interviews and iterative approach, many experiences and underlying thoughts of the nurses have been elucidated. Although this was a single-centre study in a university hospital setting, we feel that because our results are consistent with other studies, the findings are transferrable and have implications in or relevance for other healthcare settings.

Implications

Future research should focus on further investigation of the extensive roles of both nurses and their managers in medication safety, the required resources pertaining to these roles and the most powerful incentives for safety practices. Interviewing physicians and clinical pharmacists may provide a broader perspective on the nurse's role in medication safety.

Nurse managers should explicitly recognise the value of nurses' clinical reasoning as valuable to medication safety, and nurses need to be equipped with the knowledge and the leadership skills necessary to perform this role. Our study resulted in nurse involvement in the preparation for a hospital accreditation programme. In doing so we intended to ensure sufficient attention to the feasibility and appropriateness of the policies and procedures.

Conclusions

It is known that MAEs are a substantial problem. This study adds that the implementation of safety practices alone is not enough to ensure that nurses are able to perform safe medication management. Nurses play a pivotal role in medication management and safety, a role nurses value as being an intrinsic asset of their profession.

'And that's my job, what I sense/perceive from my assessment of the patient, from the nursing report, from my contact with the patient, my contact with the physician. There I am the focal point'.
WN5

This pivotal role requires sufficient knowledge of pharmacological and clinical reasoning skills that can be applied in routine working circumstances. The role

should be supported by safety practices that are evidence based, are feasible and appropriate. These factors need to be addressed synergistically by nursing managers to create a professional practice environment with shared multi-disciplinary responsibility and continuing professional education focusing on patient safety and quality of care.

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Ethical approval

Ethical approval was not considered necessary by the Institutional Review Board of the Academic Medical Centre at the University of Amsterdam, according to the Dutch Medical Ethics Law.

Authors' contributions

H.V. designed the study, and M.Z. provided methodological guidance. A.O. and M.S. conducted the interviews and performed the analysis under the supervision of H.V. and M.Z. M.S. wrote the manuscript with help of the other authors.

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Supporting information

Additional Supporting Information may be found in the online version of this article:

Appendix S1. Topic List.