

**Determining managerial implications from the
relationship between nurse outcomes and
medication safety**

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ABSTRACT

Background: Previous research has been conducted on the relationships between nurse outcomes and patient safety outcomes, mostly focussing on the influence of negative nurse outcomes on patient safety aspects such as medication errors. However, there is no summary of evidence to comprehensively describe the interrelatedness of negative nurse outcomes and medication safety, from which managerial implications for betterment of these outcomes could be derived.

Objectives: The primary objective of this study was to derive managerial implications for the improvement of nurse outcomes and medication safety by exploring and describing the relationship between negative nurse outcomes and medication errors.

Design: A systematic review was chosen as study design.

Search strategy: The following databases were used as information sources: EbscoHost (Including Academic Search Premier; CAB Abstracts; CINAHL; E-journals; Health Source Premium; International Pharmaceutical Abstracts; MasterFILE Premier; MEDLINE; PsycARTICLES and PsycINFO); PubMed; Scopus; and Web of Science. Peer-reviewed English studies published between 2013 and 2017 addressing the relationship between negative nurse outcomes (bullying and incivility, compassion fatigue, burnout, lack of job satisfaction and intent to leave) and medication errors were searched. These studies were critically appraised using the Johns Hopkins Research Evidence Appraisal Tool and the Critical Appraisal Skills Programme Tool for Qualitative Studies.

Data extraction: Both quantitative and qualitative data pertaining to the research question were extracted from included studies.

Data synthesis: Mixed methods analysis was incorporated. Quantitative data was firstly converted to qualitative data to be able to conduct thematic content analysis. After themes, based on negative nurse outcomes, were finalised, statistical support for relationships between nurse outcome themes and medication safety was provided. A forest plot was derived from odds ratios describing the correlation between burnout and medication safety. Furthermore, histograms were presented to

compare the beta coefficients and effect sizes related to other nurse outcome themes as extracted from studies.

Results: Thirteen (13) articles were included for data extraction. Themes for relationships between medication safety and all mentioned nurse outcomes were derived, including bullying and incivility, compassion fatigue, burnout, job satisfaction, and intent to leave. The two-directional relationship between medication safety and all nurse outcomes except for compassion fatigue was supported by the findings. Results of this study showed that medication errors contribute to causing symptoms of compassion fatigue while the causative impact of compassion fatigue on medication errors was not confirmed from included studies' data. In determining managerial implications from these results, three mega-themes for the manager to focus on in mitigating the effects of medication errors and negative nurse outcomes were identified, namely nurses' inner conflict, nurses' relational conflict and nurses' conflict with systems.

Conclusion: Five elements should be addressed by managers to better both medication safety and nurse outcomes, viz. resolution efforts, affirmation, teamwork, social support and training. A focus on the nurses' practice environment might assist managers in mitigating both medication errors and negative nurse outcomes, which will respectively positively impact on each other as well.

Key words: Medication safety; nurse outcomes; bullying; incivility; compassion fatigue; burnout; job satisfaction; intent to leave; and positive practice environment.

UITTREKSEL

Agtergrond: Vorige navorsing het die verhouding tussen verpleegkundige uitkomst en pasiëntveiligheid uitkomst ondersoek, alhoewel dit meestal gefokus het op die invloed wat negatiewe verpleegkundige uitkomst op pasiënt veiligheidsaspekte soos medikasiefoute uitoefen. Daar is egter geen samevatting van bewyse om die interaksie tussen negatiewe verpleegkundige uitkomst en medikasieveligheid omvattend te omskryf ten einde bestuursimplikasies ter verbetering van hierdie uitkomst daaruit af te lei nie.

Uitkomst: Die hoof uitkomst van hierdie studie was om bestuursimplikasies vir die verbetering van verpleegkundige uitkomstes en medikasieveligheid af te lei deur die verhouding tussen negatiewe verpleegkundige uitkomstes en medikasiefoute te ondersoek en te beskryf.

Ontwerp: 'n Sistematiese oorsig is as studie ontwerp gekies.

Soek strategie: Die volgende databasisse was as inligtingsbronne gebruik: EbscoHost (Insluitende Academic Search Premier; CAB Abstracts; CINAHL; E-journals; Health Source Premium; International Pharmaceutical Abstracts; MasterFILE Premier; MEDLINE; PsycARTICLES and PsycINFO); PubMed; Scopus; en Web of Science. Portuur-geassesseerde Engelse studies wat tussen 2013 en 2017 gepubliseer is en die verhouding tussen negatiewe verpleegkundige uitkomst (boelie en ongeskiktheid, uitbranding, omgee-uitputting, 'n tekort aan werksbevrediging, en intensie van beroepsverlating) en medikasiefoute was gesoek. Hierdie studies was krities geëvalueer deur middel van die Johns Hopkins Research Evidence Appraisal Tool en die Critical Appraisal Skills programme Tool for Qualitative Studies.

Data ekstraksie: Beide kwantitatiewe en kwalitatiewe data relevant tot die navorsingsvraag is onttrek van die ingeslote studies.

Data sintese: Gemengde analisemetodes was gebruik. Kwantitatiewe data is eerstens na kwalitatiewe data omgeskakel om sodoende tematiese inhoudsanalise te fasiliteer. Nadat temas, wat op negatiewe verpleegkundige uitkomstes gebaseer is, gefinaliseer is, was statistiese data wat die verhouding tussen negatiewe

verpleegkundige uitkomstemas en medikasieveligheid ondersteun, weergegee. A forest grafiek is afgelei van die kans-verhoudings wat die korrelasie tussen uitbranding en medikasieveligheid ondersteun. Verder is histogramme voorgelê om die beta-koeffisiënte en effekgroottes verwant aan ander verpleegkundige uitkomstemas soos uit studies onttrek te vergelyk.

Resultate: Dertien (13) artikels is vir data-ekstraksie ingesluit. Temas vir verhoudings tussen medikasiefoute en al die bogenoemde verpleegkundige uitkomstemas was afgelei, insluitend boelie en ongeskiktheid, omgee-uitputting, uitbranding, 'n tekort aan werksbevrediging en intensie van beroepsverlating. Die tweerigting verhouding tussen medikasieveligheid en al die verpleegkundige uitkomstemas, behalwe omgee-uitputting, is ondersteun deur die resultate. Hierdie resultate wys dat medikasiefoute bydra tot die simptome van omgee-uitputting, maar dat omgee-uitputting nie noodwendig bydra tot medikasiefoute nie. Deurdat bestuursimplikasies van hierdie resultate afgelei is om medikasieveligheid en negatiewe verpleegkundige uitkomstemas te verbeter, was drie oorsigtelike temas ontwerp, naamlik die verpleegkundige se innerlike konflik, verhoudingskonflik en konflik met stelsels.

Afleiding: Vyf elemente behoort deur bestuurders aangespreek te word ten einde beide medikasieveligheid en verpleegkundige uitkomstemas te verbeter, naamlik resolisie pogings, bemoediging, spanwerk, ondersteuning en opleiding. Deur te fokus op die verpleegkundige se werksomgewing, kan bestuurders beide medikasiefoute en negatiewe verpleegkundige uitkomstemas verbeter, wat weer in beurt mekaar positief sal beïnvloed.

Sleutelwoorde: Medikasieveligheid; verpleegkundige uitkomstemas; boelie; ongeskiktheid; omgee-uitputting; uitbranding; werksbevrediging; intensie tot beroepsverlating; en positiewe werksomgewing.

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FOREWORD: INTRODUCTION TO A MINI-DISSERTATION

This study complies with the standards of a mini-dissertation required as partial fulfilment of the degree “Master of Business Administration”. According to the General Academic Rules of the North-West University ([NWU] 2009:4), a mini-dissertation is

“a manuscript prepared for examination purposes, including a written report or a single published research article or set of published research articles or unpublished manuscripts in article format, more limited in scope than a dissertation, and in accordance with the prescripts of documentation, argumentation, language and style and which, in addition to the writing of a number of prescribed examination papers, will be evaluated with a view to determining whether the student is conversant with the method of research, and is presented in partial compliance with the requirements for obtaining a masters’ degree or honours bachelor degree or another professional degree from the University in terms of the prescribed rules.”

LIST OF ABBREVIATIONS

ANA:	American Nurses Association
CASP:	Critical Appraisal Skills Programme
EPPI:	Evidence for Policy and Practice Information
ICN:	International Council of Nurses
IQWiG:	Institute for Quality and Efficiency in Health Care
ISMP:	Institute for Safe Medication Practices
NFER :	National Foundation for Educational Research
NPSA:	National Patient Safety Agency
NWU:	North-West University
PRISMA:	Preferred Reporting Items for Systematic reviews and Meta-Analysis
RSA:	Republic of South Africa
USA:	United States of America

CHAPTER 1 – SCOPE AND NATURE OF THE STUDY

1.1 BACKGROUND

Nurses are at the forefront of implementing and managing change, meriting the exploration of leadership required among nursing management in implementing service improvements (Gousy & Green, 2015:37). Yoon *et al.* (2016:676) agree that efficient leadership is a prerequisite for optimal nursing care, while Clavelle and Fitzpatrick (2016:101) reiterate the importance of effective leadership in nursing management, as it directly impacts nurses' performance and patient outcomes. Not only should managers exert a monitoring role in ensuring quality service delivery (Hajibabae *et al.*, 2014:304), it is also management's obligation to create a non-punitive environment where errors, should they occur, can be reported and be dealt with as expediently as possible (Günes *et al.*, 2014:295). Thus, ultimately nursing management is responsible for ensuring good quality patient care, creating an environment where nurses are encouraged to provide such care and in so doing optimising the health-care facility's reputation and profitability.

One area nursing management needs to address in order to obtain above goals, is medication safety. Hertig *et al.* (2016:338) quote the 1990's notion that faulty systems, rather than faulty people are responsible for medication errors. For this reason, Hertig *et al.* (2016:338) see the positioning of leaders as essential in improving patient safety and specifically medication safety. Vaismoradi *et al.* (2016:1365) agree that nursing management has a fundamental role in ensuring medication safety. They focus on the specific role nursing management plays in the development of medication safety awareness among nurses by means of role modelling, motivation, intellectual stimulation and consideration of individuals' educational goals.

Management's attention to medication safety is understandable, as medication errors not only translate to devastating financial losses to health-care facilities (Pan *et al.* [2015] noted the annual preventable medication-error-related costs to the United States of America (USA) in 2014 was between \$620 million and \$26 billion), but also to a decline in productivity, poor patient outcomes and a resultant negative impact on these facilities' reputations (Ramsey, 2015b:108). In turn, a loss of faith in

a health-care facility will lead to the community avoiding such facilities, which will result in even lower productivity and greater financial losses. Consequently harm done by medication errors does not only affect the patient and nurse, but also the success of health-care facilities.

Although all medication errors does not lead to patient harm (Maaskant *et al.*, 2014:381), global statistics of medication error are on the increase and drive interventions to address these. In the United Kingdom (UK), medication errors accounted for approximately 20% of all deaths due to adverse events in hospitals (Leufer & Cleary-Holdforth, 2013:216). Furthermore, in the Australian Council for Safety and Quality in Healthcare report by Roughead *et al.* (2013:33) 11% of medication errors were rated as having severe consequences. In the USA, the Institute of Medicine (2006:110) reported an incidence of 11% of hospitalised patients being affected.

Research on medication administration error and safety has mostly been done in developed countries which revealed an average adverse event rate of around 10% (Bates, 2010:174). However, the Government of Ireland, Houses of the Oireachtas Joint Committee on Health and Children (2007:1) argued that 90% of medication administration errors went unreported. Furthermore, Bates (2010:174) raised the concern that less data were available from nations with developing economies such as South Africa, though the incidence of medication-administration-error-related harm in these settings tended to be higher. This higher incidence was confirmed by Blignaut *et al.* (2016:3610) as medication error was observed to affect up to 94% of patients in public hospitals in the Gauteng Province.

Even though harm done by medication errors are well documented and researched, Mayo and Duncan (2014:209) turn the attention on medication-error-related harm to nurses in terms of professional and personal status, confidence and practice. A nurse is entrusted with and trained for the care of the sick and injured (Merriam-Webster.com, 2016). With such a great responsibility to carry, it is no wonder that medication errors have such a devastating effect on the nurse's personal wellbeing, as it strikes at the heart of being a nurse and the nurses' oath to strive to do good and avoid harm (Berg, 2011:407).

Medication errors have been found to be potentiating to several negative nurse outcomes, including bullying and incivility, compassion fatigue, burnout, lack of job satisfaction and intent to leave the profession. Scott *et al.* (2009:326) introduce the phenomenon of nurses becoming “second victims” in medication errors, and further explain that nurses are traumatized by medical errors, leading them to experience physical and psychological symptoms. Elaborating on some of these symptoms or negative nurse outcomes, Rassin *et al.* (2005:873) report the fear of punishment and judgement from colleagues after a patient safety incident, while Udipi *et al.* (2008:459) and Violanti and Gehrke (2004:75) confirmed distressing clinical events such as the occurrence medication errors causing harm to patients to be predictors of compassion fatigue. Lewis (2013:153) agreed that adverse events such as medication errors are related to moral distress and burnout (specifically emotional exhaustion and depersonalisation) and Schelbred and Nord (2007:317) expressed that nurses experienced a lack of confidence in their ability to nurse (which could indicate a measure of decline in job satisfaction) and an intent to leave, not only their current employment, but nursing overall.

In turn, negative nurse outcomes as mentioned above (bullying and incivility, compassion fatigue, burnout and a lack of job satisfaction) could lead to an increase in the incidence of medication errors. Berry *et al.* (2016:337), Hamblin *et al.* (2015:2458), Laschinger (2014:284) and Tee *et al.* (2016:30), confirmed that bullying and incivility impact on the standard of patient care and incidence of adverse events. Compassion fatigue in nursing has also shown to impact the overall quality of patient care (Berger *et al.*, 2015:e11) and perceptions of medication errors (Maiden *et al.*, 2011:339). Burnout is also significantly associated with more nurse-reports of poor quality of care (Poghosyan *et al.*, 2010:288). Considering job satisfaction, McHugh *et al.* (2012:566) and You *et al.* (2013:154) found significant relationships between lower job satisfaction and negative patient outcomes such as medication errors, while Paquet *et al.* (2013:82) found turnover (nurses acted on their intent to leave) to be significantly correlated with medication errors.

Contributing to adverse nurse outcomes, a recent escalation in bullying among nurses was observed (Fink-Samnack, 2015:165). Bullying is seen as any persistent negative act across the spectrum of violence, ranging from verbal bullying to physical assault (Abe & Henley, 2010:116). Incivility is closely related to bullying. Incivility

can be defined as a low-intensity behaviour with ambiguous intent to harm that violates workplace norms of mutual respect (Guidroz, 2010:177). Gallo (2012:62) and Kolanko *et al.* (2006:34) agree to the violation of mutual respect being distinctive of incivility, including disrespect for others, the inability or unwillingness to listen to others' points of view or to seek common ground, condescending speech or attitudes and not appreciating relevance of social discourse.

Compassion fatigue is a particular problem in the nursing profession because of the amount of emotional energy required to care for patients, in addition to the many physical and mental demands (Myatt *et al.*, 2015:306). Coetzee and Laschinger (2017) define compassion fatigue as “the disengagement of caregivers from their patients, which culminates in a reduction or inability to feel empathy and compassion toward patients, and an inability to provide the patient care deemed appropriate.” Compassion fatigue is manifested by several physical, emotional, social, spiritual, and intellectual effects, which culminate in the loss of a meaningful and purposeful interaction between caregivers and patients (Coetzee & Klopper, 2010:241 & Doss-McQuitty, 2016:461) and often a result of being involved in an unanticipated patient event, medical error, and/or patient-related injury (Scott *et al.*, 2009:326). Ullström *et al.* (2014:325) compare compassion fatigue symptoms to those of post-traumatic stress, leading to changes in career, decrease in quality of life, risk of burnout, increase in use of drugs and alcohol, suicidal thoughts and suicide.

Suppressing negative emotions such as those experienced after involvement in an adverse patient event, is a risk factor for patient-related burnout (Pisaniello *et al.*, 2012:589). According to Maslach and Leiter (1997) burnout is a mismatch between a person and six domains of his or her job environment, namely workload, control, reward, community, fairness, and values. The Institute for Quality and Efficiency in Health Care ([IQWiG], 2017) explain that burnout could be the consequence of severe stress and exertion towards helping people while other contributing leading to burnout include criticism (Scholes, 2013:263) or a response to disruptive behaviour from colleagues (Leiper, 2014:1). Common indicators of burnout is feeling exhausted, listless and unable to cope, alienating one-self from work-related activities and reduced performance (IQWiG, 2017).

The physiological and psychological distress and erosion of professional confidence caused by negative nurse outcomes can lead to a premature exit of nurses from the profession (Ramsey, 2015b:108). This indicates a decline in job-satisfaction with an increased intention to leave the profession. Van Mol *et al.* (2015:1) warn that quality of patient care (and ultimately the success of the business of healthcare) is seriously compromised by healthcare professionals leaving their jobs prematurely in order to preserve their own health. This exit causes a decreased morale and a decline in productivity in a facility, which in turn will lead to financial loss (Ramsey, 2015b:108). Thus, negative nurse outcomes such as bullying and incivility, compassion fatigue, burnout and decreased job-satisfaction and intent to leave are decidedly injurious, firstly to the patient as it could induce adverse events such as medication error, secondly to the nurse as it impacts on his/her psychological health and lastly to the health-care facility as it may damage the reputation and profitability thereof.

Overall, Coetzee *et al.* (2013:162) found that the practice environment of South African nurses had a significant positive association with nurse outcomes and nurse reported quality of care and patient safety, which is also widely published in the international arena (Aiken *et al.*, 2008:3330; Friese, 2005:765; Kutney-Lee *et al.*, 2013:195; and Shang *et al.*, 2013:306). Therefore, focus on the nurses' practice environment might assist managers in mitigating both medication errors and negative nurse outcomes, which will respectively positively impact on each other as well. As the culture of an organization reflects the leadership (Ramsey, 2015a:58) it is up to the management of health-care facilities to create an environment free from bullying and incivility and to constantly address effects and predictors of compassion fatigue, burnout and decreased job satisfaction, not only to nurture their workforce, but also to protect their patients from medication errors and to mitigate the resultant detriment to the facility's reputation and finance. Although some research has been conducted on the relationships between nurse outcomes and patient safety outcomes, there is no summary of evidence to comprehensively describe the interrelatedness of these variables, specifically nurse outcomes and medication safety, from which managerial implications for betterment of these outcomes could be derived.

1.2 PROBLEM STATEMENT

Medication errors is a major contributor to adverse events in health-care (Australian Council for Safety and Quality in Healthcare, 2002:1; Institute of Medicine, 2006:110; Leufer & Cleary-Holdforth, 2013:216; and the National Patient Safety Agency [NPSA], 2010:1). Adverse events such as medication errors are both a predictor of negative nurse outcomes (Lewis, 2012:1; Udipi *et al.*, 2008:459; and Violanti & Gehrke, 2004:75) and a consequence of negative nurse outcomes (Berry *et al.*, 2016:337; Hamblin *et al.*, 2015:2458; Laschinger, 2014:284; Maiden *et al.*, 2011:339; and Tee *et al.*, 2016:30). Research in patient safety are progressing towards the notion that faulty systems, rather than individual people, are ultimately responsible for most patient safety lapses (Hertig *et al.*, 2016:338). If systems rather than nurses are implicated for failures in medication safety, management should focus on both nurse and patient outcomes as resultant from system impacts in order to mitigate medication errors. For this reason, a better understanding of the interplay between nurse outcomes and medication errors is required. Although some research has been conducted on relationships between nurse outcomes and medication safety, a synthesis of this evidence to guide managers in mitigating both medication errors and negative nurse outcomes is not yet available.

1.3 SCOPE OF THE RESEARCH

In this study, the research scope is determined by the variables explored. Nurse outcomes (including bullying, incivility, compassion fatigue, burnout, job satisfaction, and intent to leave) were discussed as interrelated with the patient outcome of medication safety. Both patient and nurse outcomes are influenced by health-facility systems. The role that management, especially nursing management (unit managers, section managers and nursing managers) play in the clinical setting with relation to alleviate both negative nurse and patient outcomes as presented, was derived. Relationships between these variables were discussed as extracted from current literature, in order to present management implications for betterment of nurse outcomes and medication safety.

1.4 CONTRIBUTION OF THE STUDY

The focus of this study is nursing management's role in mitigating medication administration errors as a threat to patient safety as well as negative nurse outcomes as threat to nurses' well-being. Research revealed that medication errors and nurse outcomes have a potentiating effect on each other. In synthesising data on this potentiating relationship between negative nurse outcomes and medication errors, management is provided with a way forward in caring for nurses, improving medication safety in their facilities and ultimately addressing negative financial and reputational outcomes resulting from these adverse events.

1.5 RESEARCH QUESTION

Considering the above mentioned problem statement, the following research question was developed:

- What managerial implications for improvement of patient and nurse outcomes could be derived from the two-directional relationship between negative nurse outcomes and the incidence of medication errors?

1.6 OBJECTIVES

The primary objective of this study was to derive managerial implications for the improvement of medication safety and nurse outcomes by exploring and describing the relationship between negative nurse outcomes and medication errors.

To address this primary objective, the following secondary objectives were set:

- To review recent evidence on the impact of negative nurse outcomes on medication errors;
- To review recent evidence on the impact of medication errors on negative nurse outcomes; and
- To present management implications for the betterment of medication safety and nurse outcomes in health-care facilities.

1.7 THEORETICAL FRAMEWORK

Models, theories, concepts and definitions are included in the theoretical framework of a study (Botma *et al.*, 2010:187). The importance of a theoretical basis, being a theory, model or framework, is reiterated by Botma *et al.* (2010:96) who state that it adds to the meaningfulness and generalizability of research.

Emanuel *et al.* (2008:15) proposed a model with which to view patient safety aspects such as medication safety. In this model, patient safety aspects could be seen in the light of four domains, namely those who work in health-care, those who receive health-care or have a stake in its availability, the infrastructure or systems for therapeutic interventions (health-care delivery processes) and the methods for feedback and continuous improvement (Emanuel *et al.*, 2008:15). This model provides a theoretical basis for the study. Figure 1 depicts a schematic presentation of this model.

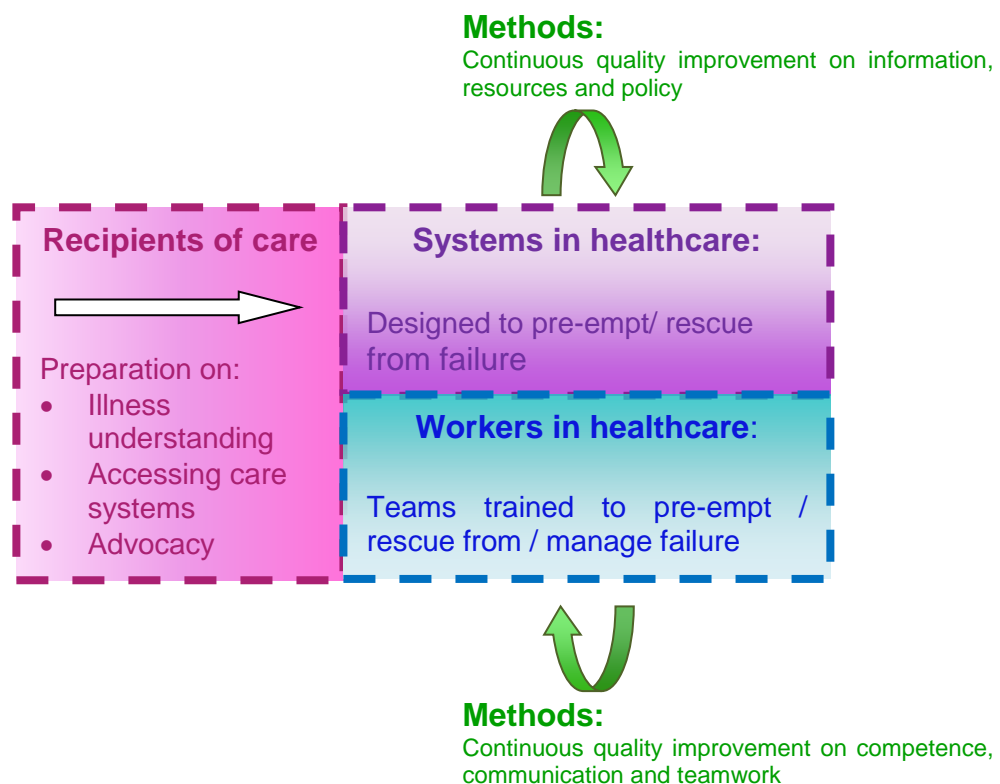


Figure 1.1 A patient safety model for health-care (Emanuel *et al.*, 2008:15)

In this research, the relevant patient safety aspect is medication safety. Within medication safety, both the patient and the nurse could be in need of care, the patient being directly impacted by medication errors, and the nurse being impacted by

the development of secondary negative nurse outcomes. Therefore, both the patient and the nurse should be seen as recipients of care in this study. Workers in the health-care (nurses and other health professionals) and interaction between these workers are presented as impacting on medication safety and nurse outcomes, while systems in health care and especially failures leading to negative nurse outcomes and medication safety also received attention. All of these elements contributed to determining methods for continuous improvement, which included improvement of information, resources and policy related to systems, and improvement on competence, communication and teamwork related to workers in health care.

1.7.1 Terminology

1.7.1.1 Medication errors

A *medication error* can be defined as any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is under control of the healthcare professional, patient or consumer (Medical Dictionary for the Health Professions and Nursing, 2012).

1.7.1.2 Nurse outcomes

According to Pearson *et al.* (2006:341), *nurse outcomes* include outcomes associated with the physical and mental health of the nurse, encompassing well-being, job and role satisfaction, decision making, control and autonomous practice, competency, perceptions of the work environment and work-life balance. Under this wide umbrella bullying, incivility, compassion fatigue, burnout, job satisfaction, and intent to leave are classified under the physical and mental health of the nurse and perceptions of the work environment.

1.7.1.3 Bullying

Bullying can be defined as any persistent negative act across the spectrum of violence (Abe & Henley, 2010:116). This spectrum of violence could start with verbal bullying which includes passive actions that result in humiliation, threats of violence, practical jokes or being shouted at and reminded of errors (Abe & Henley, 2010:116; and Cooper *et al.*, 2009:212) or escalate to physical bullying that includes intimidating behaviours and signals to quit (Abe & Henley, 2010:116). Abe and

Henley (2010:116) describe other forms of bullying as exploitation (demanding excessive productivity or displays of organizational commitment), undervaluation (removing responsibilities and assigning work below competence to inevitably imply performance shortfalls) or isolation (exclusion from the work group).

1.7.1.4 Incivility

Incivility is low-intensity behaviour with ambiguous intent to harm that violates workplace norms of mutual respect (Guidroz *et al.*, 2010:177). Characteristics of incivility include disrespect for others, the inability or unwillingness to listen to others' points of view or to seek common ground, condescending speech or attitudes and not appreciating relevance of social discourse (Gallo, 2012:62 and Kolanko *et al.*, 2006:34).

1.7.1.5 Compassion fatigue

Compassion fatigue is a state of being disengaged from the patient and impotent to meet the patient's needs, as well as feeling hopeless as a caregiver (Coetzee & Laschinger, 2017).

1.7.1.6 Burnout

The term *burnout* is used to describe the consequences of severe stress and exertion towards helping people, which lead to emotional exhaustion, depersonalization and low personal accomplishment (IQWiG, 2017).

1.7.1.7 Job satisfaction

Job satisfaction could be described as the pleasurable emotional state resulting from the appraisal of one's job as achieving one's job values (Locke, 1976:1297). Thus, it indicates the level of contentment with one's employment.

1.7.1.8 Intent to leave

Intent to leave can be classified as intent to leave a current job or intent to leave the nursing profession altogether (Sanders, 2015:8).

1.8 RESEARCH DESIGN

Mouton (1996:107) describes a research design as a set of guidelines and instructions to be followed in addressing the research problem. Both quantitative and qualitative elements were employed in this study.

1.9 RESEARCH METHODOLOGY

According to the National Foundation for Educational Research (NFER, 2015:1), the research method should be selected with consideration of how the research questions could be answered or what method would best address the research objectives. A systematic review was decided on for the methodology of this study. Systematic reviews combine evidence on a specific topic (Joanna Briggs Institute, 2000 and Botma *et al.*, 2010:241) in order to derive evidence for best practices (Fox, 2017:88). The growing global information dissemination increases the need for systematic reviews (Hemingway & Brereton, 2009:2) to make it easier for readers to obtain an overview on a topic without having to sift through vast amounts of data.

Precision and duplicability are two elements of systematic reviews that distinguish it from other reviews (Botma *et al.*, 2010:241; and Clark, 2011:64). To this end, initiatives to improve the quality of reporting combined results of studies have been explored since 1996, which lead to the development of the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines (Jüni & Egger, 2009:1221). Thus, the PRISMA checklist (Moher *et al.*, 2009:5; Addendum 1) was used to guide the research method. Four phases of the systematic review methodology are presented, namely the conceptual phase, search strategy, data extraction and data synthesis (Brink *et al.*, 2013:241).

Specific steps as derived from several sources (Botma *et al.*, 2010:241; Briner & Denyer, 2012:328; Kolotylo & Bauman, 2014:5; and Margarey, 2001:377-379) were imposed on these phases, taking into account requirements set out by the PRISMA checklist (Addendum 1):

- Conceptual phase:
 - Identify the research problem; and
 - Establish a research protocol.

- Search strategy phase:
 - Locate relevant literature;
 - Select studies; and
 - Establish the quality of the studies.
- Data collection phase:
 - Examine studies and extract relevant data.
- Data synthesis phase:
 - Combine the findings; and
 - Document and disseminate the findings.

These phases are discussed under sections 1.9.1 to 1.9.4.

1.9.1 Conceptual phase

In identifying the problem, Khalid *et al.* (2003:118) explain that a systematic review has to have a valuable question. In this study, the problem was identified in that there is no summary of evidence to clarify the relationship between nurse outcomes and medication errors which could inform managerial implications for betterment of both nurse and patient outcomes.

Meade and Richardson (1997:532) and Khalid *et al.* (2003:119) mention four components of a “well-built” clinical question, namely: the patient group being investigated, interventions, comparative interventions and the outcomes used to measure the effect. The PRISMA Checklist (Addendum 1) adds a fifth component, namely study designs, to be included. With this in mind, the PICOS (Participants, Interventions, Comparator, Outcomes and Study Designs) of the current review was developed:

- The **P**articipants for this study were nurses involved in the medication process;
- The **I**ntervention focussed on is medication administration;
- The safety of medication administration correlated with better or worse nurse outcomes constitute the **C**omparator, whether the medication safety affected nurse outcomes or nurse outcomes affected medication safety;
- The **O**utcomes might include either better nurse outcomes or better medication safety, depending on which one of these variables were the dependent variable of a specific included study; and

- All **Study** designs were included in this review, as to broaden the scope of the review, thereby attaining all recent research on the study topic.

Studies satisfying the above elements were thus seen as the study population.

1.9.2 Search strategy phase

The following databases were used as information sources in searching for relevant studies: EbscoHost (Including Academic Search Premier; CAB Abstracts; CINAHL; E-journals; Health Source Premium; International Pharmaceutical Abstracts; MasterFILE Premier; MEDLINE; PsycARTICLES and PsycINFO); PubMed; Scopus; and Web of Science. Khalid *et al.* (2003:118) explain that relevance to the systematic review at hand should be considered in locating studies. Therefore, studies aimed at addressing the PICOS of the study was considered for inclusion.

Search terms included “Medication*” or “Drug*”; Bullying OR intimidation OR victimisation OR victimization; Incivility or uncivil; “Compassion fatigue” OR “secondary traumatic stress” OR “secondary traumatic stress disorder” OR “second victim” OR “helper stress” OR “vicarious traumatization” OR “vicarious traumatization” OR “secondary victimisation” OR “secondary victimization” “counter-transference”; Burnout OR “burn out” OR burn-out; “Job stress” OR “work stress” OR “occupational stress”; “Job satisfaction” OR “work satisfaction” OR “employee satisfaction” OR “career satisfaction” OR “job dissatisfaction” OR “work dissatisfaction” OR “employee dissatisfaction” or “career dissatisfaction”; and “Intent to leave” OR “Intention to leave”.

After attaining the search results, the Evidence for Policy and Practice Information-reviewer (EPPI-reviewer 4) software was used to remove duplicates. Thereafter title and abstract sifting took place. Finally, full-text studies were accessed for further inclusion consideration based on specific eligibility criteria as proposed in the PRISMA checklist (Addendum 1). These criteria included:

- Addressing the PICOS elements sufficiently;
- Being published between January 2013 and November 2017;
- Full text articles being available in English;

- Presenting peer-reviewed methodologies (grey literature were excluded from the study); and
- Obtaining a score of 70% or more in critical appraisal.

References from reference lists of full-text articles considered for inclusion were searched for any additional studies that met the inclusion criteria.

To conclude the search strategy phase of the systematic review, the quality of studies needs to be investigated as Khalid (2003:118) explains that the quality of individual studies will ultimately determine the quality of the systematic review results. This was done firstly by obtaining an overview of methodologies and the rigour evident in the studies, and secondly by critical appraisal of articles. Critical appraisal was conducted using the Johns Hopkins Research Evidence Appraisal Tool (Addendum 3) and the Critical Appraisal Skills Programme (CASP) Tool for Qualitative Studies (Addendum 4). A percentage was calculated from the score on items from these tools. Any publication achieving a percentage above 70 was included for data extraction.

1.9.3 Data collection phase

Due to the limited amount of studies applicable to the review, which limited the importance of specific statistical results, the data extraction table for this review comprised only two columns, the first identifying the applicable study, and the second indicating any results relevant to the review.

1.9.4 Data synthesis phase

Mixed methods analysis was incorporated for this review. According to Onwuegbuzie and Combs (2011:3) mixed analysis involves the analysis of quantitative and qualitative data concurrently or sequentially. Onwuegbuzie and Combs (2011:3) further explain that a researcher could conduct a qualitative analysis of quantitative data by transforming the quantitative data to qualitative data thus called *qualitizing*. The results from studies were mostly quantitative, although further quantitative analysis thereof was limited due to different statistical measures presented in included studies. Therefore, quantitative data extracted from the

studies were qualitized in that it was grouped together in themes corresponding to different nurse outcomes explored. Thematic content analysis was thus relevant.

Cresswell (2009:184) provides the following steps for thematic content analysis:

- Organise and prepare;
- Develop a general sense;
- Code the data;
- Describe and identify themes;
- Represent findings; and
- Interpret the data.

After thematic content analysis, descriptive statistics in the form of frequencies were presented to describe the incidence of reporting of different themes (nurse outcomes) in relation to medication safety. Due to the minimalistic presentation of inferential statistics in the included papers, synthesis of these results was limited. However, a forest plot was derived from odds ratios describing the correlation between medication safety and burnout. Furthermore, histograms were presented to compare the beta coefficients and effect sizes presented in studies focusing on some of the other nurse outcomes.

1.10 RIGOUR

Borenstein *et al.* (2009:280) proposed the best approach to minimizing bias in systematic reviews is to perform a truly comprehensive search of the literature. Therefore, a subject librarian was involved in the development of the search strategy to ensure that all sources, including difficult to find studies were included, in order to reduce some of the effects of publication bias. To add, an expert in medication errors, an expert in nurse outcomes and an expert in management were involved in the design of the study. Furthermore the reference lists of included articles were hand searched to ensure that all relevant studies were considered for inclusion. To add, the systematic review was done according to a set process, including the acknowledged PRISMA checklist (Addendum 1) to improve rigour. Hemingway and Brereton (2009:4) discuss the importance of strategies aimed at minimising bias, while Brink *et al.* (2013:208) define bias as anything that can influence the results of the study to skew the outcomes thereof. Bias can either be related to individual

studies or across studies (PRISMA checklist [Addendum 1]). These biases were addressed in more detail.

1.10.1 Risk of bias in individual studies

The risk of bias toward individual studies might arise from it being seen in a more positive or more negative light depending on the reputation of the publishing journal or the country of origin of the study. In this review, this risk was mitigated by employing two critical appraisal tools that judge all studies' quality according to a standardised set of requirements, thus eliminating the threat of studies being excluded just on face value.

A further source of bias against a specific study could be that the researcher does not agree with the findings of the study, or that it does not support the hypothesised outcome of the review. This was mitigated by including all results from critically appraised articles, whether it concluded that a relationship between medication safety and nurse outcomes exists or not.

1.10.2 Risk of bias across studies

Reviewer bias across studies was minimised by reporting the process followed thoroughly, thus presenting the review as open to scrutiny from peers for possible biases. The importance of duplicability of systematic reviews is confirmed by Botma *et al.* (2010:241).

Only reputable databases were used and this was defended by the authority and search ability of the database to ensure all relevant literature to be included (Adams *et al.*, 2016:10). The use of four different databases for collecting the sample widened the scope of the search, ensuring that more search results be considered for inclusion and minimising the chance of excluding relevant literature.

1.11 ETHICAL CONSIDERATIONS

Research ethics is a generic term for various ways of understanding moral research (Neale, 2009:31). Put plainly, the welfare and rights of the subject should always be placed above the needs of the investigator (Peat *et al.*, 2002:283).

Although no informed consent is required in conducting a systematic review, some ethical considerations are still relevant to the study (Weingarten *et al.*, 2004:1013). Firstly, the ethical conduct as presented in included studies should be considered. The following points were considered:

- The studies were examined for ethical clearance or by using personal judgement to decide whether a specific study was conducted in an ethical manner.
- The researcher was aware of the risk of plagiarism. Plagiarism is an ethical issue involving the use of someone else's work and reciting it as one's own without the proper acknowledgement to the person who wrote / invented it first (Wager & Wiffen, 2011:132). Therefore, both included studies and the review itself were scrutinised for any unethical use of another researcher's work.
- Accuracy of information provided is an ethical consideration. Results obtained from studies were not manipulated and comments on results were verified with results from other research in order to not influence the true representation of evidence available, as was suggested by Wager and Wiffen (2011:130-133).
- Lastly, fairness in selection of studies should be considered. For this reason, the PICOS guideline and other eligibility criteria were kept in mind when deciding on reviewing a study.

In this systematic review precautions were taken so as to conduct this study in an ethically correct manner and all precautions mentioned above were implemented.

1.12 LIMITATIONS

The following limitations to the study were anticipated:

- The absence of an adequate amount of studies on the research topic could influence the relevance of results;
- Recent literature on the topic was limited as openness to address this sensitive issue poses problems (e.g. ethical clearance, response rates and voluntary participation challenges) in conducting empirical research;

- Statistical analysis of findings were restricted due to different statistical measures used across studies; and
- Limiting the search to medication errors instead of general adverse events could lead to the exclusion of relevant literature, although not applicable specifically to medication safety.

In order to mitigate for these anticipated limitations, the following measures were incorporated:

- All efforts were made to obtain all relevant studies on the field, including the use of a subject librarian's services to obtain difficult-to-find studies;
- Historical research on the topic was included in discussions;
- Thematic content analysis was employed to still ensure meaningful result synthesis; and
- Studies excluded for addressing general adverse events rather than medication errors alone were used as supporting evidence in discussion of the results.

1.13 LAYOUT OF THE STUDY

This dissertation contains four chapters. The layout of the study is thus presented:

Chapter 1: Scope and nature of the study

In this chapter, a background to the study was provided, setting out the scope of the study, the problem statement, design and methodology incorporated and how quality of the research was ensured. It also presented the possible limitations of the study.

Chapter 2: Methodology

Chapter 2 provides an introduction to the Systematic Review methodology. It describes the four phases of a systematic review and incorporates the specific elements relevant to this study.

Chapter 3: Results and discussion of results

In this chapter the results of the systematic review is presented. The outcomes of the search strategy, data extraction and discussion of these results were provided.

Chapter 4: Study evaluation, limitations and recommendations

The last chapter presents an evaluation of the study with recommendations derived from the results. Recommendations for nursing management, policy, practice and education was set out.

1.14 SUMMARY

Medication errors pose a key threat to patient safety and also impact on the well-being of the nurse, while nurse outcomes such as bullying and incivility, compassion fatigue, burnout, job-satisfaction, and intent to leave in turn might add to the incidence of medication errors. Although the relationship between these variables and the responsibility of health-care management in limiting these adverse events have been researched as free-standing components, no summative exploration drawing managerial implications from the relationship between nurse outcomes and medication safety was available. Background to the study was provided; where-after a problem-statement was formulated, following onto the research questions, research aims and objectives, and design. Details on the proposed research method were discussed, as well as rigour, ethical considerations and classification of proposed chapters of the research.

CHAPTER 2 – METHODOLOGY

2.1 INTRODUCTION

In this chapter of the study, the systematic review methodology was described. Thus, specific phases of a systematic review, namely the conceptual phase, search strategy, data extraction and data synthesis phase were presented, together with the different steps embedded in each phase.

2.2 THE SYSTEMATIC REVIEW PROCESS

Fox (2017:88) defends the relevance of systematic reviews by stating that policies and evidence for best practice are derived from these summative studies, while Brink *et al.* (2013:17) refers specifically to the impact of systematic reviews on nursing care. A growing need for systematic reviews emerged due to the global information explosion (Hemingway & Brereton, 2009:2). This is because systematic reviews combine all the available evidence on a specific topic and provide the reader with a well-rounded and unbiased summary of the best information on that topic (Joanna Briggs Institute, 2000 and Botma *et al.*, 2010:241), without having to sift through vast amounts of data.

Clark (2011:64) not only agrees with the summative nature of systematic reviews, but adds precision as another characteristic. Botma *et al.* (2010:241) elaborate that details of the systematic review process should be followed and described in such a way as to ensure ease of duplication. It is this openness to peer review that sets systematic reviews apart from other literature reviews. To this end, initiatives to improve the quality of reporting combined results of studies have been explored since 1996, which lead to the development of the Preferred Reporting Items for Systematic reviews and Meta-Analysis (PRISMA) guidelines (Jüni & Egger, 2009:1221). As Milner (2015:89) reiterates the importance of following specific steps which will lead to good quality systematic reviews, the PRISMA checklist (Moher *et al.*, 2009:5; Addendum 1) was used to guide the research method. Jüni and Egger (2009:1221) confirm that the PRISMA checklist is widely endorsed by academic journals.

To incorporate the checklist, the four phases of systematic reviews as presented by Brink *et al.* (2013:241), viz. the conceptual phase, search strategy, data extraction and data synthesis were used to group steps and items in the methodology followed. Numerous sources provide specific steps to follow in each of these phases (Botma *et al.*, 2010:241; Briner & Denyer, 2012; Kolotylo & Baumann, 2014; and Margarey, 2001:377-379). The steps as constituents of each phase are presented in figure 2.1 and discussed in more detail thereafter, taking into account items from the PRISMA checklist.

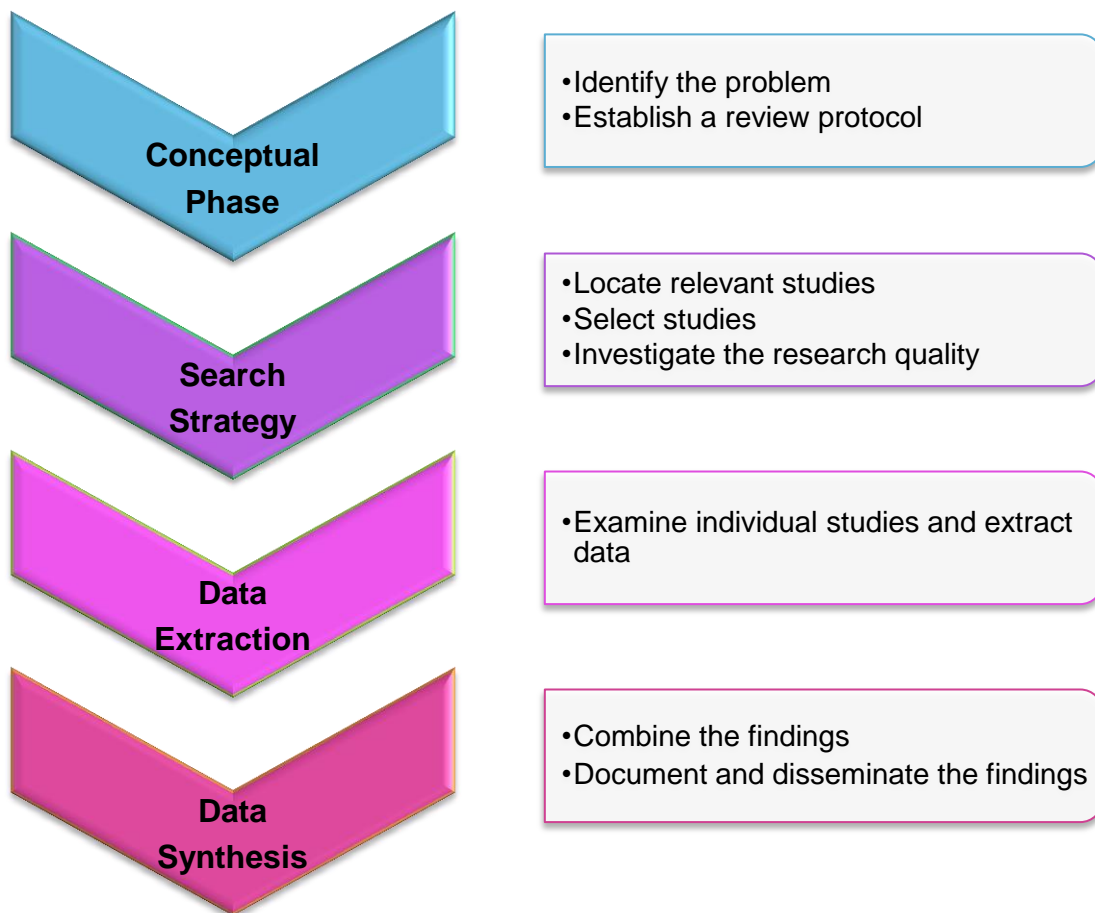


Figure 2.1 Phases of a Systematic Review with related steps

2.2.1 Conceptual phase

Within the conceptual phase, the research problem needs to be identified, and a review protocol has to be established.

2.2.1.1 Identifying the problem

In identifying the problem, Khalid *et al.* (2003:118) explain that a systematic review has to have a valuable question. The Joanna Briggs Institute (2000:2) elaborates that the question's scope depends on how much information is available on the topic under investigation. If the field to be explored is relatively new, the scope should be broader, as Milner (2015:89) agrees that there has to be sufficient academic literature available on the subject to complete the systematic review. In this study, the problem was identified in that there is no summary of evidence to clarify the relationship between nurse outcomes and medication errors which could inform managerial implications for betterment of both nurse and patient health.

As both the recipients of health care and the workers in health care's safety, be it physical or psychological, are at stake in this field of research, the research problem was deemed valuable. Although some research on this relationship has been done, especially on the linear relationship with nurse outcomes being the causative factor in medication errors, the field of exploring medication errors as leading to negative nurse outcomes is still a new field. For this reason, the scope of the review was kept broad, not only focusing on one nurse outcome such as job satisfaction, burnout or compassion fatigue, but rather including all studies that revealed causative relationships between any nurse outcome and medication errors, with medication errors being either the dependent or the independent variable.

Meade and Richardson (1997:532) mention four components of a "well-built" clinical question, viz. the patient group being investigated, interventions, comparative interventions and the outcomes used to measure the effect. Khalid *et al.* (2003:119) concur with these components. The PRISMA Checklist (Addendum 1) prescribes that an explicit statement of the question being addressed with reference to these four components should be provided, adding in a fifth element, namely study designs to be included. With this in mind, the PICOS (Participants, Interventions, Comparator, Outcomes and Study Designs) of the current review was taken into consideration:

- The **P**articipants for this study was nurses involved in the medication process;
- The **I**ntervention focussed on is medication administration;

- The safety of medication administration correlated with better or worse nurse outcomes constitute the **Comparator**, whether the medication safety affected nurse outcomes or nurse outcomes affected medication safety;
- The **Outcomes** might include either better nurse outcomes or better medication safety, depending on which one of these variables were the dependent variable of a specific included study; and
- All **Study** designs were included in this review, thereby attaining all recent research on the study topic.

2.2.1.2 Establishing a review protocol

Establishing a review protocol is the second step in the conceptual phase of a systematic review (Kolotylo & Baumann, 2014:11). The review protocol provides an overview of the planned study, such as was provided in Chapter 1.

2.2.2 Search strategy

To implement the search strategy phase, literature relevant to the research question has to be located, studies need to be selected in accordance with this relevance, and the research quality of each study needs to be established.

2.2.2.1 Locate relevant literature

Sindhu and Dickson (1997:211) reiterate the importance of locating all relevant literature on the study topic through a comprehensive search in order to avoid bias. The PRISMA checklist (Addendum 1) prescribes all information sources to be described. In order to ensure the search to be comprehensive, the following databases were used as information sources in searching for relevant studies: EbscoHost (Including Academic Search Premier; CAB Abstracts; CINAHL; E-journals; Health Source Premium; International Pharmaceutical Abstracts; MasterFILE Premier; MEDLINE; PsycARTICLES and PsycINFO); PubMed; Scopus; and Web of Science.

Khalid *et al.* (2003:118) explain that relevance to the systematic review at hand should be considered in locating studies. Milner (2015:90) reminds the researcher that the PICO helps to determine what to search, while the PRISMA checklist

(Addendum 1) mentions the importance of presenting a detailed search strategy to facilitate duplication of the search. Taking into account the PICOS as presented in 2.2.1.1, the search framework as presented in table 2.1 was used to detect possibly relevant studies. The term “Medication*” or “Drug” in combination with one of the terms from the “Second variable” column were used as search terms.

Table 2.1: Search terms based on PICOS

First Variable	Second variable
Medication* OR Drug*	Bullying OR intimidation OR victimisation OR victimization
	Incivility OR uncivil
	“Compassion fatigue” OR “secondary traumatic stress” OR “secondary traumatic stress disorder” OR “second victim” OR “secondary victimisation” OR “secondary victimization” OR “helper stress” OR “vicarious traumatisatio” OR “vicarious traumatization” OR “counter transference”
	Burnout OR “burn out” or burn-out
	“Job stress” OR “work stress” OR “occupational stress”
	“Job satisfaction” OR “work satisfaction” OR “employee satisfaction” OR “career satisfaction” OR “job dissatisfaction” OR “work dissatisfaction” OR “employee dissatisfaction” OR “career dissatisfaction”
	“Intent to leave” OR “intention to leave”

Ten Ham-Baloyi and Jordan (2016:123) add that a time-frame for published studies could also be considered while Magarey (2001:378) does not see the recording of a publishing time-frame as an optional element in locating of studies. A time-frame of the last five years were employed, as this is seen as “recent” by both leading peer reviewed journals in the field of nursing and the Johns Hopkins Critical Appraisal Tool for research studies (American Nurses Association [ANA], 2015; ANA, 2016:2; and International Council of Nurses [ICN], 2017). Literature were searched during November 2017, searching for studies published from 2013 to date.

2.2.2.2 Selecting studies

In selecting studies, the PRISMA checklist (Addendum 1) proposes that the screening and eligibility of the studies should be discussed. After attaining the

search results, these results were imported into the Evidence for Policy and Practice Information-reviewer (EPPI-reviewer 4) software. The EPPI-reviewer 4 software is a web-based programme for managing and analysing data and has been developed for all types of systematic reviews (EPPI-Centre, 2008:1). This software has the functionality to manage systematic reviews through all stages of the process from bibliographic management, screening, coding and right through to synthesis (Thomas *et al.*, 2010:1). Full specifications of the EPPI-reviewer 4 software are presented in Addendum 2.

By importing references into this software, duplicate studies were removed automatically and near-identical abstracts were identified and compared for further duplicate exclusion, as Kwon *et al.* (2015:184) explain that the use of multiple databases often leads to duplicated results. Thereafter the titles of studies were sifted through for relevance. If relevance could not be determined from the study title, the abstracts were assessed for relevance. Finally, full-text studies were accessed for further inclusion consideration based on specific eligibility criteria as proposed in the PRISMA checklist (Addendum 1). These criteria included:

- Addressing the PICOS elements sufficiently;
- Being published between January 2013 and November 2017 (ANA [2016:2] explains that the current year should be included in the five years set for determining recentness of literature);
- Full text articles being available in English;
- Presenting peer-reviewed methodologies (refer to discussion below on exclusion of grey literature); and
- Obtaining a score of 70% or more in critical appraisal. (Critical appraisal is discussed as component of determining the quality of the studies.)

Grey literature was not included in this study. The Fourth International Conference on Grey Literature (1999:4) defines grey literature as that which is produced on all levels of government, academics, business and industry in print and electronic formats, but not controlled by commercial publishers. Alberani *et al.* (1990:358) explain that it includes reports, theses, conference proceedings, technical specifications and standards, non-commercial translations, bibliographies, technical and commercial documentation, and official documents not published commercially.

The decision to exclude grey literature in this study was based on Higgins and Green's (2011:1) explanation that the inclusion of data from unpublished studies could introduce publication bias as the studies that can be located may be an unrepresentative sample of all unpublished studies. Also, unpublished studies may be of lower methodological quality than published studies (Higgins & Green, 2011:1).

Furthering the process of selecting studies, the Joanna Briggs Institute (2000:3) propose that included studies' bibliographies should be searched to identify further relevant studies for inclusion. Therefore, the bibliographies of full-text articles considered for inclusion were scrutinised for any additional studies that met the inclusion criteria. The inclusion of studies identified by doing this was considered taking into account the exclusion criteria used for the first search round.

2.2.2.3 Investigate the quality of the studies

To conclude the search strategy phase of the systematic review, the quality of studies needs to be investigated as Khalid (2003:118) explains that the quality of individual studies will ultimately determine the quality of the systematic review results. The Johanna Briggs Institute (2000:1) affirms the need for quality assessment of studies. Botma *et al.* (2010:244) explain that the researcher has to assess the studies for their methodological correctness in this step. In order to contribute to this step, a table was constructed to provide an overview of the methodology (sample, data collection and data analysis), strengths, and weaknesses of individual studies.

To follow through on in-depth investigation of the quality of the studies, critical appraisal of studies is required. Briner and Denyer (2012:328) propose critical appraisal to be a key part of a systematic review, explaining that, by applying specified criteria for assessing the study, potential biases could be mitigated. Critical appraisal was conducted by incorporating the Johns Hopkins Research Evidence Appraisal Tool (Addendum 3) and the Critical Appraisal Skills Programme (CASP) tool for qualitative studies (Addendum 4). Ten Ham-Baloyi and Jordan (2016:124) support the notion of using more than one critical appraisal tool in stating that there is not just one specific tool which would suite the appraisal criteria for all designs. Following this, the CASP Tool was added for critical appraisal of qualitative studies

as the Johns Hopkins Research Evidence Appraisal Tool alone was found to not address all important issues related to qualitative research.

The Johns Hopkins Research Evidence Appraisal Tool is aimed at evaluating the quality of evidence of a study (ANA, 2015:1). All quantitative studies were assessed using the following items from this tool:

- Does the researcher identify what is known and not known about the problem and how the study will address any gaps in knowledge?
- Was the purpose of the study clearly presented?
- Was the literature review current (most sources within last five years or classic)?
- Was the sample size sufficient based on the study design and rationale?
- If there is a control group:
 - Were the characteristics and/or demographics similar in both the control and intervention groups?
 - If multiple settings were used, were the settings similar?
 - Were all groups equally treated except for the intervention group(s)?
- Are data collection methods described clearly?
- Were the instruments reliable (Cronbach's α [alpha] > 0.70)?
- Was instrument validity discussed?
- If surveys/questionnaires were used, was the response rate > 25%?
- Were the results presented clearly?
- If tables were presented, was the narrative consistent with the table content?
- Were study limitations identified and addressed?
- Were conclusions based on results?

As no studies revealed methodologies including control groups, the three questions related to these were omitted from the critical appraisal process. Mixed methods studies were anticipated to be evaluated by the same items as listed above, however no mixed methods studies were included in the final study sample.

The CASP Tool for Qualitative Studies was used for qualitative study appraisal together with relevant items from the Johns Hopkins Research Evidence Appraisal Tool, adding items to better assess the quality of these studies:

- Was there a clear statement of the aims of the research?
- Was a qualitative methodology appropriate?
- Was the research design appropriate to address the aims of the research?
- Was the recruitment strategy appropriate to the aims of the research?
- Was the data collected in a way that addressed the research issue?
- Has the relationship between the researcher and the participants been adequately considered?
- Have ethical issues been taken into consideration?
- Was the data analysis sufficiently rigorous?
- Was there a clear statement of findings? and
- How valuable is the research?

A percentage was obtained by calculating a score out of relevant questions. Irrelevant questions were subtracted from the total used for calculating percentages. A question was labelled as irrelevant if it addressed an aspect that was not relevant to the specific type of study (for example the Cronbach alpha of an instrument is not applicable to a qualitative study). For qualitative studies, a score was determined from the aggregate score from relevant CASP and Johns Hopkins Research Evidence Appraisal Tool items. A checklist was prepared to provide an overview of items appraised in each study, also presenting the calculation for determining the critical appraisal score and the final percentage achieved by each study. Any publication achieving a percentage above 70 was included for data extraction.

2.2.3 Data extraction

During the data extraction phase, each of the individual studies needs to be examined in order to collect relevant data from them.

2.2.3.1 Examine individual literature sources and collect data

The PRISMA checklist (Addendum 1) determines that the method of extracting data from studies should be described. In this review, the extraction method was purposively planned to include a broad spectrum of results, as not much literature was available on the subject yet. Therefore, although Botma *et al.* (2010:245) and Milner (2015:90) propose the use of a data collection tool for improving the outcomes

of the review, the data extraction table for this review comprised only two columns, one for identifying the applicable study, and another to indicate any results relevant to the review.

Haddaway *et al.* (2017:357) express the need for consistency and objectivity in this step of the review process, while Milner (2015:91) reminds the researcher to repeatedly compare the extracted data with the research question in order to ensure that no deviation from the topic takes place. In order to address the objectivity, all relevant findings from studies were extracted, not only those confirming a relationship between the variables under investigation.

2.2.4 Data synthesis

The last phase of the systematic review, namely data synthesis, includes combining the findings, and documenting and disseminating these findings in the correct way.

2.2.4.1 Combine findings of the systematic review

The combining of results should lead to the research question being addressed by a summary of all the available data on the topic of interest (Ten Ham-Baloyi & Jordan, 2016:120). Botma *et al.* (2010:245) elaborate that the data should be reported in such a way so as to best address the research question. This reporting could include tables or statistical measures (Khalid *et al.*, 2003:118). However, due to the limited amount of studies included in this review, limited statistical evidence for the relationship between medication safety and nurse outcomes have been extracted from literature, and the statistical data that were presented took different forms, such as odds ratios being reported in one study while another only reported frequencies of nurses' reports. For this reason, thematic content analysis of results ensued. However, statistical data inputs that were presented could not be ignored, which indicated that a measure of mixed analysis was required.

According to Onwuegbuzie and Combs (2011:3) mixed analysis involves the analysis of quantitative and qualitative data concurrently or sequentially, and at its most integrated form involves a form of cross-over analysis wherein one analysis type associated with one tradition (e.g. quantitative analysis) is used to analyse data associated with a different tradition (e.g. qualitative data). Onwuegbuzie and Combs

(2011:3) further explain that a researcher could conduct a qualitative analysis of quantitative data by transforming the quantitative data to qualitative data thus called qualitzing.

In this review, quantitative data as presented in the included studies was qualitized in that results were grouped together in themes representing the different nurse outcomes explored. Thereafter minor descriptive statistics in the form of frequencies were presented to describe the incidence of reporting of different themes (nurse outcomes) in relation to medication safety. This was done to triangulate results, complement quantitative data and to clarify the quantitative findings thematically, representing three of the five reasons for mixed analysis as provided by Greene *et al.* (1989:255) in their seminal work.

A pioneer in the field, Morse (1994:25), summarised the cognitive processes involved in analysing qualitative data as firstly comprehending the phenomenon of study, secondly synthesising a portrait of the phenomenon that accounts for relations and linkages within its aspects, thirdly theorising about how and why these relations appear as they do and lastly re-contextualising, or putting the new knowledge about the phenomena and relations back into the context of how others have articulated the evolving knowledge. The end result aimed at in this review was to re-contextualise the relationship between nurse outcomes and medication safety in order to derive managerial implications for betterment of both patient and nurse outcomes. In order to reach this goal, thematic content analysis as proposed by Holloway (2005:242) was used to analyse the data. Cresswell (2009:184) provides the following steps for thematic content analysis:

- Organise and prepare;
- Develop a general sense;
- Code the data - Coding is a method that enables one to organize and group similarly coded data into categories or "families" because they share some characteristics (Saldana, 2010:12). Thus, coding reduce the amount of data into more manageable groupings (Welman *et al.*, 2011:213). Saldana (2010:10) further explains that coding includes a systematic ordering, classification and categorization;

- Describe and identify themes - Themes are umbrella constructs (Welman *et al.*, 2011:211) under which inputs are categorised.
- Represent findings; and
- Interpret the data.

Quantitative analysis followed qualitative analysis. Neale (2009:131) proposes the use of descriptive and inferential statistics in quantitative analysis. However, due to the small sample of studies included, inferential statistical synthesis was very limited. Thus, descriptive statistics in the form of frequencies was presented to portray the most often researched nurse outcomes related to medication safety, followed by a forest plot on available odds ratios and histograms to present comparisons between beta coefficients and effect sizes across studies. According to Cantley (2016) a forest plot is a key way to summarise data from multiple papers in a single image and identify common statistics from said papers. Although not as comparative as forest plots, a histogram can be used to present the frequency distribution of the data, thus the frequency distribution of beta coefficients and effect sizes across studies was presented in this manner.

2.2.4.2 Document and disseminate the findings

As tables are often used to summarize all the information retrieved (Milner, 2015:91), a table of themes (nurse outcomes) as related to medication safety was presented. Managerial implications were focussed on betterment of these themes, building a strategy for improvement of both nurse and patient outcomes. Dissemination of the findings is proposed to be done by publishing in a peer-reviewed journal.

2.3 SUMMARY

In this chapter, the four phases of the systematic review process were discussed together with steps involved in each of these phases. This process described involved the steps taken to achieve a synthesis of results from studies addressing the relationship between nurse outcomes and medication safety. The results of these phases were presented in Chapter 3.

CHAPTER 3 – RESULTS AND DISCUSSION OF RESULTS

3.1 INTRODUCTION

This chapter covers the results and discussion of the results, flowing from the study selection, through the addressing of study characteristics, data extraction, synthesis of results and the conclusion. These elements of discussion are all presented by the PRISMA checklist (Addendum 1).

3.2 STUDY SELECTION

3.2.1 Outcomes of search

In total, 1113 results were obtained from the initial search. Table 3.1 presents the amount of search results from each database emanating from the initial search with regards to variables searched in combination with “Medication*” or “Drug*”.

Table 3.1: Amount of search results per database related to various search terms

Search terms used in combination with “Medication*” or “Drug”	Search result per database			
	EbscoHost	Pubmed	Scopus	Web of Science
Bullying OR intimidation OR victimisation OR victimization	203	12	57	62
Incivility OR uncivil	15	1	2	1
“Compassion fatigue” OR “secondary traumatic stress” OR “secondary traumatic stress disorder” OR “second victim” OR “secondary victimisation” OR “secondary victimization” OR “helper stress” OR “vicarious traumatisation” OR “vicarious traumatization” OR “counter transference”	23	21	38	25
Burnout OR “burn out” or burn-out	135	11	45	59
“Job satisfaction” OR “work satisfaction” OR “employee satisfaction” OR “career satisfaction” OR “job dissatisfaction” OR “work dissatisfaction” OR “employee dissatisfaction” OR “career dissatisfaction”	124	9	105	50
“Job stress” OR “work stress” OR “occupational stress”	35	28	18	22
“Intent to leave” OR “intention to leave”	5	4	2	1

After duplicates were removed, 682 results remained for title sifting. Sixty-five (65) abstracts were considered for relevance, of which 27 were chosen for further evaluation. From these, two full-text articles were excluded because of not being available in English, one was excluded as it could not be retrieved, even with the help of a subject librarian, and 24 full-text articles were obtained for further evaluation. At this stage, ten studies were excluded as the full-text proved them irrelevant to the study topic. From the 14 remaining studies' reference lists, another 16 titles were identified for possible inclusion, preliminary sifting indicating that all eligibility criteria were met. However, on further evaluation, only one of these 16 studies proved relevant and available in English and was thus included for critical appraisal. Figure 3.1 presents a PRISMA flow-diagram of the search outcomes.

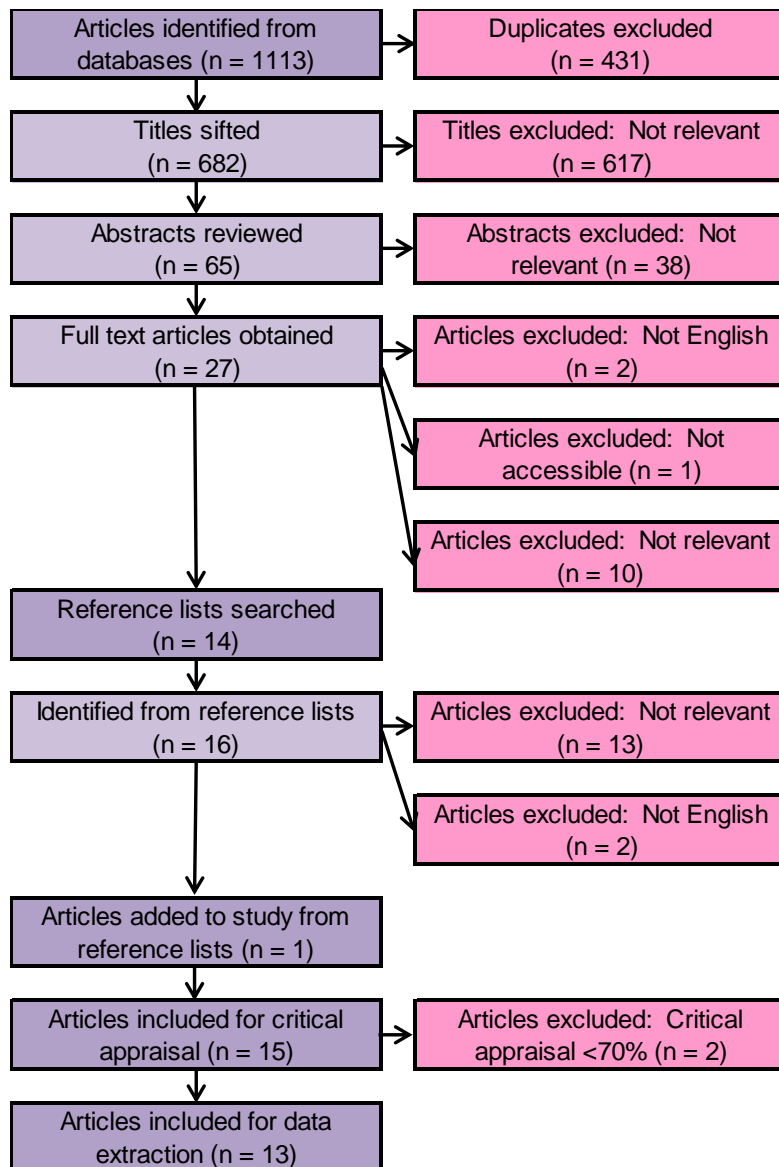


Figure 3.1 PRISMA flow-diagram of search outcomes

Of the studies included, 12 were quantitative studies and one was a qualitative study. The quality of the studies as related to the different research designs follows.

3.2.2 Quality of studies obtained

The quality of studies was first assessed by presenting an overview of the methodologies, strengths and limitations involved. Table 3.2 presents the authors and publishing date, setting, methodology (sample, data collection and data analysis), strengths and limitations of each of the 15 studies included for critical appraisal. The 14 quantitative studies were presented first, followed by the one qualitative study.

In the quantitative studies, strengths included adequate sample sizes and rigorous statistical analyses applied. However, there were also the limitations to several studies. In five of the studies, statistical analyses were limited to descriptive statistics or very limited inferential statistics. Samples were often limited to less than five institutions for data collection. Regarding the sample of the qualitative study, the biggest critique is the convenience sampling method used.

Study settings varied greatly, with one study originating in the United States of America, Canada, India, Taiwan, Thailand and Turkey respectively, two from Australia, another two from Belgium and four from Iran. Thus, there was a good distribution of research done in developed versus developing countries, with seven of these studies originating in developed countries. Markedly, Iran tips the scale towards research done in developing countries, represented by one quarter of the research available.

Table 3.2: Quality assessment of methodology, strengths and weaknesses of studies

Quantitative studies					
Authors & Date	Title	Setting	Methodology	Strengths	Limitations
Bolandianbafghi et al. (2017)	Correlation between medication errors with job satisfaction and fatigue of nurses	Iran	<p><u>Sample:</u> 170 nurses from an educational hospital.</p> <p><u>Data collection:</u> A questionnaire of demographic characteristics, medication administration error and nurses' job satisfaction and fatigue was used.</p> <p><u>Data analysis:</u> Descriptive and inferential statistics: Pearson correlation coefficients and independent-samples t-tests.</p>	<p>Sufficient sample size with excellent response rate.</p> <p>Strong statistical measures employed.</p> <p>Unexpected findings reported.</p>	<p>Background presented from non-recent sources.</p> <p>Sample limited to nurses from a single hospital.</p> <p>Maintaining of confidentiality is not discussed – the Hawthorne effect might have been relevant.</p>
Chiang et al. (2017)	Predictors of hospital nurses' safety practices - work environment, workload, job satisfaction and error reporting	Taiwan	<p><u>Sample:</u> N = 1800, n = 1380 nurses from 6 teaching hospitals.</p> <p><u>Data collection:</u> Questionnaires including the Nursing Safety Practice Scale and the Nursing Practice Environment Scale.</p> <p><u>Data analysis:</u> Descriptive statistics, bivariate correlation and multiple linear regression analyses.</p>	<p>Statistically adequate sample size with 77% response rate.</p> <p>Conclusions supported by rigorous statistical analysis.</p>	<p>Results based on self-report which might not reflect actual incidence.</p> <p>Sample not homogenous as systems differ across sample hospitals.</p>
Duffield et al. (2014)	Instability in patient and nurse characteristics, unit complexity and patient and systems outcomes	Australia	<p><u>Sample:</u> N = 62, n = 2 medical-surgical wards across three states. N = 1673, n = unknown nurses.</p> <p><u>Data collection:</u> Medical records were reviewed; Surveys included items measuring demographical data, the Practice Environment Scale and the Environmental Complexity Scale.</p> <p><u>Data analysis:</u> Descriptive statistics (frequencies).</p>	<p>Methodology described adequately.</p> <p>Good background to the problem provided.</p>	<p>Relationships between variables were not further explored by inferential statistics.</p> <p>Only two of the 62 sampled wards' data were presented.</p> <p>Clarity on how many surveys included in this report lacks.</p>

Authors & Date	Title	Setting	Methodology	Strengths	Limitations
Grissinger (2017)	Unresolved disrespectful behavior in health care - practitioners speak up (again): Part 1`	Unknown	<p><u>Sample:</u> N = unknown, n = 4884 physicians, pharmacists and nurses.</p> <p><u>Data collection:</u> Survey (no further information available).</p> <p><u>Data analysis:</u> Although not described, descriptive statistics were derived.</p>	Large sample size. Longitudinal comparison with previous study could add to rigour of the study.	Methodology not described. No data available on the survey used or statistical measures incorporated for data analysis. No literature background provided.
Kiymaz & Koç (2017)	Identification of factors which affect the tendency toward and attitudes of emergency unit nurses to make medical errors	Turkey	<p><u>Sample:</u> N = 310, n = 284 nurses from emergency service units.</p> <p><u>Data collection:</u> Questionnaires incorporating the Medical Error Tendency Scale and the Medical Error Attitude Scale.</p> <p><u>Data analysis:</u> Descriptive statistics, Kruskal-Wallis and Mann-Whitney U tests as well as Spearman correlation.</p>	Excellent response rate (92%). Use of previously validated scales.	Results derived from a specific area, generalizability limited. Limited use of inferential statistics.
Manias et al. (2014)	Medication errors in hospitalised children	Australia	<p><u>Sample:</u> n = 2753 medication errors.</p> <p><u>Data collection:</u> Online voluntary incident reporting system and medical records of children were reviewed.</p> <p><u>Data analysis:</u> Descriptive statistics including frequencies.</p>	Large sample size. Data triangulation between different data sources increased rigour of the study.	Sample from a single hospital. Retrospective – used data up to seven years old. Data based on self-report. Analysis limited to descriptive statistics.

Authors & Date	Title	Setting	Methodology	Strengths	Limitations
Nantsupawat et al. (2016)	Nurse burnout, nurse-reported quality of care, and patient outcomes in Thai hospitals	Thailand	<p><u>Sample</u>: N = 2450, n = 2084 nurses working in 94 community hospitals in Thailand.</p> <p><u>Data collection</u>: A questionnaire including the Maslach Burnout Inventory and questions on nurse perceived quality of care and patient outcomes was used.</p> <p><u>Data analysis</u>: Descriptive statistics were followed by bivariate and multivariate analyses done by logistical regression modelling.</p>	<p>Large sample size with good response rate.</p> <p>Strong statistical methods used.</p> <p>Adequate adjustment for confounding variables declared.</p>	<p>Cross-sectional design might not adequately support causal links between variables.</p> <p>Self-report of adverse events might be lower than actual incidences.</p>
Paquet et al. (2013)	Psychosocial work environment and prediction of quality of care indicators in one Canadian health center	Canada	<p><u>Sample</u>: N = 795, n = 243 healthcare workers from 13 wards of a university affiliated health center.</p> <p><u>Data collection</u>: A questionnaire combining scales from the psychological climate questionnaire, Siegrist's Effort/Reward Imbalance Questionnaire and Social Support subscales from the Job Content Questionnaire was used.</p> <p><u>Data analysis</u>: Descriptive statistics were employed, where after univariate and multivariate analyses followed. This lead to structural equation modelling.</p>	<p>Adequate sample size.</p> <p>Well-described background.</p> <p>Reliability of questionnaires established.</p> <p>Strong statistical evidence presented.</p>	<p>Weak response rate (31%).</p> <p>Study conducted in a single facility, limiting the generalizability of results.</p> <p>Opportunities for error were based on unit size rather than actual count.</p> <p>Underreporting of medication errors might have influenced the study's results.</p>

Authors & Date	Title	Setting	Methodology	Strengths	Limitations
Paurnamdar & Zare (2016)	The evaluation of the mediation errors from nurses point of view	Iran	<p><u>Sample</u>: N = 87, n = 87 nursing students.</p> <p><u>Data collection</u>: Questionnaires requiring information on medication error evaluation.</p> <p><u>Data analysis</u>: Descriptive statistics (frequencies).</p>	An assumed 100% response rate (Clarity on amount of questionnaires distributed lacked). Reliability of instrument is good (Chronbach alpha = 0.91).	Only descriptive statistics provided. Limited sample size with inadequate discussion of target population. Conclusions mostly derived from literature rather than study findings.
Rezaeiain et al. (2017)	The relationship between work commitment, dynamic, and medication error	Tehran	<p><u>Sample</u>: N = 120, n = 117 nurses working in ICUs.</p> <p><u>Data collection</u>: Questionnaires with questions regarding demographics, including portions focused on work commitment, work dynamic and medication errors were used.</p> <p><u>Data analysis</u>: Descriptive statistics (frequencies) and inferential statistics including t-tests, Pearson's correlation, and linear regression.</p>	Strong statistical analysis. Adequate sample size, with excellent response rate. Instruments with previously tested validity and reliability used.	Validity and reliability of instruments not tested in current setting. Self-reporting might underplay the real medication administration error rate. All potential confounding variables might not have been corrected for in regression analyses.
Shahrokhi et al. (2013)	Factors effective on medication errors: A nursing view	Iran	<p><u>Sample</u>: 150 registered nurses working in teaching hospitals.</p> <p><u>Data collection</u>: Questionnaires containing items on demographics and common causes of medication errors were used.</p> <p><u>Data analysis</u>: Descriptive statistics and inferential statistics including Freidman tests for one-way repeated measures.</p>	Good reliability of instrument noted. 100% response rate.	Sample limited to teaching hospitals. Limited incorporation of inferential statistical methods.

Authors & Date	Title	Setting	Methodology	Strengths	Limitations
Van Bogaert et al. (2014)	Nursing unit teams matter: Impact of unit-level nurse practice on environment, nurse work characteristics, and burnout on nurse reported job outcomes, and quality of care, and patient adverse events - A cross-sectional survey	Belgium	<p><u>Sample:</u> N = 1201, n = 1108 nurses.</p> <p><u>Data collection:</u> Data was collected using the Nursing Work Index Revised, three instruments measuring the nurse work characteristics, the Maslach Burnout Inventory Human Services Survey, two items measuring nurse-reported job outcomes and items measuring adverse patient events.</p> <p><u>Data analysis:</u> Descriptive statistics and intra-class correlation coefficients were examined. Multilevel modelling was also incorporated.</p>	<p>Big sample with good response rate.</p> <p>Rigorous statistical analyses applied.</p> <p>Well-formulated results section.</p> <p>Many interrelated variables were explored.</p>	<p>Nurses from only two hospitals completed the questionnaire, limiting generalizability of results.</p> <p>Results were based on nurse-reported adverse events, which could have been underreported.</p>
Van Gerven et al. (2016)	Psychological impact and recovery after involvement in a patient safety incident: a repeated measures analysis	Belgium	<p><u>Sample:</u> N = 24118, n = 1755 healthcare professionals.</p> <p><u>Data collection:</u> Surveys measuring demographic variables, experiences with patient safety incidents, also included the Impact of Event Scale, questions from the Life Orientation Test and the Hospital Survey on Patient Safety Culture.</p> <p><u>Data analysis:</u> Descriptive statistics were followed by confirmatory factor analysis and inferential statistics aimed at identifying associations between psychological impact and various variables.</p>	<p>Stringent statistical analysis followed.</p> <p>Very big data set was available to work from, increasing reliability of the results.</p> <p>Study addresses a gap in the current knowledge regarding second victims of adverse events.</p>	<p>The response rate to the survey was very low (7%).</p> <p>Non-response bias could have occurred.</p> <p>The interplay of confounding variables in the psychological processing of adverse events cannot be excluded.</p> <p>Due to the retrospective character of the study, events might have been under- or overplayed by participants.</p>

Authors & Date	Title	Setting	Methodology	Strengths	Limitations
Wilson et al. (2017)	Quantifying burnout among emergency medicine professionals	India	<p><u>Sample</u>: N = 105, n = 105 doctors and nurses employed in emergency medical departments in four tertiary care hospitals.</p> <p><u>Data collection</u>: A questionnaire including socio-demographic details, the Maslach Burnout Inventory and risk factors for burnout was employed.</p> <p><u>Data analysis</u>: Descriptive statistics and inferential statistics such as univariate analysis and multivariate analysis using binary logistic regression were incorporated.</p>	Strong statistical evidence provided. Power calculation for sample size done, thus adequate sampling. Validated instrument used.	All confounding variables might not have been taken into account in determining correlations. Restricted permission from hospitals might have excluded relevant participants from the study. All health care professionals working in the emergency departments were not sampled.
Qualitative study					
Authors & Date	Title	Setting	Methodology	Strengths	Limitations
Delacroix (2017)	Exploring the experience of nurse practitioners who have committed medical errors: A phenomenological approach.	Florida	<p><u>Sample</u>: 10 nurses who previously made medical errors.</p> <p><u>Data collection</u>: Face-to-face audiotaped semi-structured interviews were conducted.</p> <p><u>Data analysis</u>: Thematic concept analysis with phenomenological considerations.</p>	Literature embedding was done thoroughly. Themes and results presented systematically and clearly. Methodology applicable for research question.	Convenience sampling was used which might impact on the rigour of the study, also impeding transferability of results. The sensitive nature of the interview questions might have prevented participants to fully share their experiences. No comment on sample size or data saturation offered.

Continuing with the quality assessment of studies, table 3.3 provides a checklist of items from the Johns Hopkins Critical Appraisal Tool for research studies with the studies' critical appraisal score calculated.

Table 3.3: Checklist of critical appraisal items for quantitative studies

Author/s and publication date	What is known/not known identified	Purpose clearly presented	Literature <5years	Sample size sufficient	Data collection described clearly	Instrument reliable (Cronbach Alpha >0.70)	Instrument validity discussed	Response rate >25%	Results presented clearly	Tables consistent with narrative	Limitations identified and addressed	Conclusions based on results	Critical appraisal calculation	Critical appraisal score
Bolandianbafghi <i>et al.</i> (2017)	✓	✓	X	✓	✓	✓	✓	✓	✓	✓	X	½	$\frac{9.5}{12}$	79%
Chiang <i>et al.</i> (2017)	✓	✓	½	✓	✓	✓	✓	✓	✓	½	½	✓	$\frac{10.5}{12}$	88%
Duffield <i>et al.</i> (2014)	✓	✓	X	X	✓	✓	✓	✓	½	✓	½	½	$\frac{8.5}{12}$	71%
Grissinger (2017) EXCLUDE	½	½	X	✓	X	X	X	✓	✓	-	X	✓	$\frac{5}{11}$	46%
Kiyamaz & Koç (2017)	✓	✓	½	✓	✓	✓	X	✓	½	✓	½	✓	$\frac{9.5}{12}$	79%
Manias <i>et al.</i> (2014)	✓	✓	X	✓	✓	X	½	-	✓	✓	½	✓	$\frac{8}{11}$	73%
Nantsupawat <i>et al.</i> (2016)	✓	✓	X	✓	✓	½	X	✓	✓	✓	✓	✓	$\frac{9.5}{12}$	79%
Paquet <i>et al.</i> (2013)	✓	✓	X	✓	✓	½	X	✓	✓	✓	✓	✓	$\frac{9.5}{12}$	79%
Pournamdar & Zare (2016) EXCLUDE	✓	½	X	✓	½	✓	½	✓	½	✓	X	½	$\frac{7.5}{12}$	63%
Rezaiamin <i>et al.</i> (2017)	✓	✓	X	✓	✓	✓	✓	✓	✓	½	✓	✓	$\frac{10.5}{12}$	88%
Shahrokhi <i>et al.</i> (2013)	✓	✓	½	½	✓	✓	✓	✓	✓	✓	✓	✓	$\frac{11}{12}$	92%
Van Bogaert <i>et al.</i> (2014)	✓	✓	½	✓	✓	X	X	✓	✓	½	✓	✓	$\frac{9}{12}$	75%
Van Gerven <i>et al.</i> (2016)	✓	✓	✓	✓	✓	X	X	X	✓	✓	✓	✓	$\frac{9}{12}$	75%
Wilson <i>et al.</i> (2017)	½	✓	X	✓	✓	X	X	✓	✓	✓	✓	✓	$\frac{8.5}{12}$	71%

Critical appraisal of the qualitative study was conducted by incorporating the CASP Tool for Qualitative studies and the Johns Hopkins Critical Appraisal Tool for research studies. Items relevant to the qualitative study, as well as the performance of the study in these items are presented in table 3.4.

Table 3.4: Critical appraisal items for the qualitative study

Author and publication date	What is known/not known identified	Purpose clearly presented	Literature <5years	Sample size sufficient	Data collection described clearly	Results presented clearly	Limitations identified and addressed	Conclusions based on results	Qualitative methodology appropriate	Recruitment strategy appropriate	Relationship with participants considered	Ethical issues taken into consideration	Data analysis rigorous	How valuable is the research	Critical appraisal calculation	Critical appraisal score
Delacroix (2017)	✓	✓	X	½	✓	✓	½	✓	✓	X	X	✓	✓	✓	$\frac{10}{14}$	71%

Figure 3.2 provides a graphical presentation of the performance of the studies during critical appraisal, indicating percentages attained and the cut-off of 70% indicated by the red line.

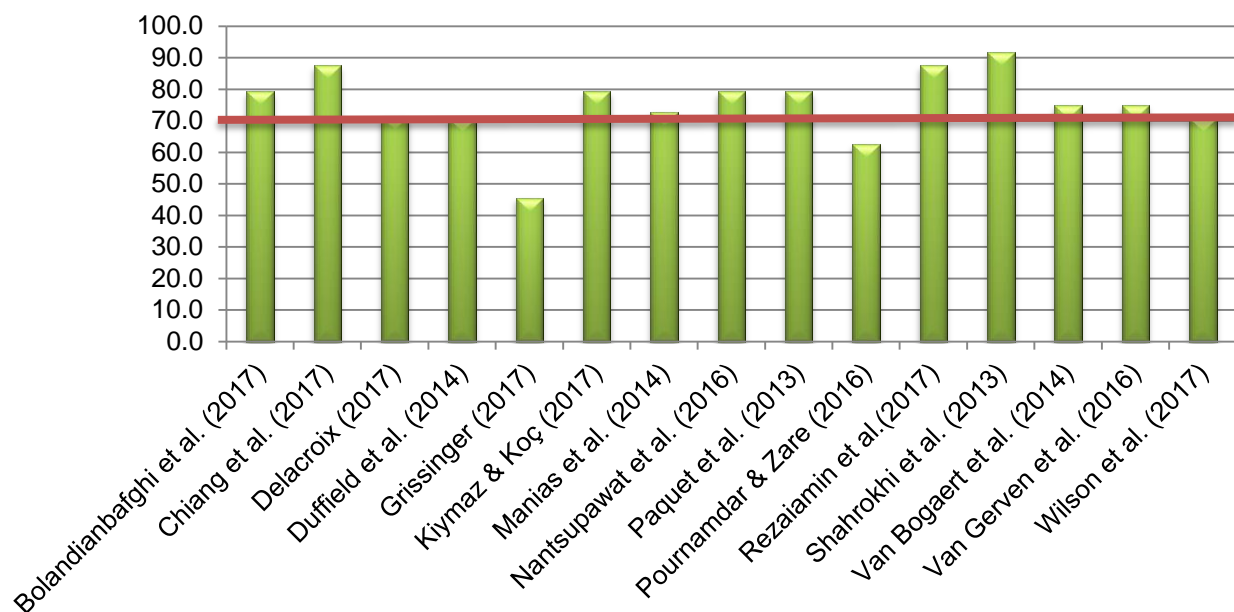


Figure 3.2 Studies' percentages attained in critical appraisal

Noted from the figure, two studies were excluded due to low critical appraisal scores. These two articles were not included for data extraction. Thus, a final count of 13 articles was seen as the study sample.

3.3 DATA EXTRACTION

Data were extracted in accordance with the relevance to the review. Table 3.5 presents studies' results applicable to this systematic review.

Table 3.5: Data extraction results

Authors & Date	Findings related to this review
Bolandianbafghi <i>et al.</i> (2017)	No significant relationship between job satisfaction and medication errors could be detected. (Pearson coefficient = -0.15, p = 0.057).
Chiang <i>et al.</i> (2017)	Medication administration safety was positively associated with job satisfaction (r = 0.153, p < 0.01). Regression analysis revealed that job satisfaction significantly correlates with medication administration safety (β = 0.076, p < 0.001).
Delacroix (2017)	Medication errors were often recalled as medical errors. Nurses who committed errors felt victimized, fear and uncertainty regarding the patient's and their own welfare. Regarding fear for themselves, they felt self-doubt, disappointment and dread related to the possibility of making future errors or facing disciplinary action. Respondents viewed errors as personal lapses and professional failures. Incidents translating to patient harm had the following effects on nurses: Acute physical, emotional and cognitive reactions, including panic and a sense of doom, manifested in "feeling sick", experiencing nausea, dyspnoea, tachycardia and insomnia, nightmares, cognitive impairments such as rumination, hyper-vigilance, worrying and experiencing flashbacks. Fear and anxiety lead to obsessive behaviours.
Duffield <i>et al.</i> (2014)	The ward with a greater percentage of nurses being forced to change to another ward (41.7% versus comparative 37.7% of total sample) and greater percentage of absenteeism (35.6% against total sample presenting 26.2%) also presented with more medication errors (50% versus 19.9% for the total sample).
Kiyamaz & Koç (2017)	A practically significant association between job satisfaction and a tendency to commit a medical error (mostly medication errors) were determined (Kruskal-Wallis = 11.84, p = 0.054).

Authors & Date	Findings related to this review
Manias <i>et al.</i> (2014)	Intimidating behaviour was mentioned in 18 records (0.3%) as the cause of medication errors.
Nantsupawat <i>et al.</i> (2016)	Emotional exhaustion, depersonalization and low personal accomplishment negatively impacted perceived medication errors. High emotional exhaustion was associated with perceived increase in medication errors (Odds ratio = 1.47, 95% confidence interval = 1.05 - 2.07), while high depersonalization showed increased incidence of perceived medication errors (Odds ratio = 1.83, 95% confidence interval = 1.34-2.48). Low personal accomplishment showed an increase of perceived medication error incidence (Odds ratio = 1.49, 95% confidence interval = 1.13-1.96). All p-values showed statistical significance below 0.03.
Paquet <i>et al.</i> (2013)	Absenteeism and turnover were significantly correlated with medication errors (effect sizes = -0.813 and 0.409 respectively, $p < 0.001$ for both correlations).
Rezaiamin <i>et al.</i> (2017)	A significant inverse association between work commitment and the incidence of medication errors was noted ($r = 0.25$; $p = 0.006$). Linear regression confirms this association ($\beta = -0.30$ with a 95% confidence interval). The p-value was statistically significant at 0.006.
Shahrokhi <i>et al.</i> (2013)	A lack of job interest was mentioned by 92.6% of nurses to lead to medication errors ($n = 139$).
Van Bogaert <i>et al.</i> (2014)	Emotional exhaustion and depersonalization were found to be predictors of medication errors (Odds ratio 1.39 and 1.68 respectively, p -values < 0.001), showing statistical significance to these correlations without practical significance.
Van Gerven <i>et al.</i> (2016)	The impact of a patient safety incident on the nurse (mostly medication incidents reported) was statistically and practically associated with the severity of the harm caused to the patient. Incidents that caused death to the patient had an effect size of $\beta = 9.78$ ($p < 0.001$) while incidents causing moderate harm revealed $\beta = 6.75$ ($p < 0.001$).
Wilson <i>et al.</i> (2017)	The fear of medication errors was significantly correlated with the diminished feeling of personal accomplishment as element of burnout, with an odds ratio of 3.61 (95% confidence interval = 1.26-10.37) and p-value of 0.017.

3.4 SYNTHESIS OF RESULTS

Results were themed according to nurse outcomes, with elements related to specific nurse outcomes as subthemes (table 3.5).

Table 3.6: Themes and subthemes derived from studies' results

Theme (nurse outcome)	Subthemes (constituents of nurse outcomes)
Bullying and incivility	<ul style="list-style-type: none"> • Feeling victimized • Fear of punishment • Facing disciplinary action • Supervisors being “cold and distant” • Intimidating behaviour
Compassion fatigue	<ul style="list-style-type: none"> • Physical symptoms: <ul style="list-style-type: none"> ○ “feeling sick” ○ Nausea ○ Dyspnoea ○ Tachycardia ○ Insomnia • Emotional and psychological symptoms <ul style="list-style-type: none"> ○ Nightmares ○ Flashbacks ○ Worrying ○ Panic ○ Sense of impending doom ○ Emotional outbursts ○ Denial ○ Emotional numbness • Social symptoms <ul style="list-style-type: none"> ○ Feeling detached from patients • Intellectual symptoms <ul style="list-style-type: none"> ○ Rumination ○ Hyper-vigilance ○ Recurring thoughts ○ Avoidance
Burnout	<ul style="list-style-type: none"> • Emotional exhaustion • Depersonalization • Low personal accomplishment
Job satisfaction	<ul style="list-style-type: none"> • Self-doubt in ability to perform job-related duties • Experiencing errors as personal lapses • Experiencing errors as professional failures • Being forced to change to different ward settings • Absenteeism
Intent to leave	<ul style="list-style-type: none"> • Turnover • Intending to leave the current work environment • Intending to leave the nursing profession

Themes (nurse outcomes) were further discussed in relation to medication safety:

Firstly, two studies revealed a relationship between medication safety and bullying. Delacroix (2017:405) reports the paradox of error victimization as evidenced by fear and uncertainty. They especially feared disciplinary action. This then indicates that medication safety impacted nurses' perception of bullying and incivility. On the other hand, Manias *et al.* (2014:74) reported that some respondents felt that intimidating behaviour could cause medication errors.

Related to compassion fatigue, two studies indicated that medication safety impacted on this nurse outcome. Delacroix (2017:405) explained that nurses experienced physical, psychological and cognitive symptoms such as feeling sick, experiencing nausea, dyspnoea, tachycardia and insomnia, panic, a sense of doom, having nightmares and flashbacks about the errors, rumination, and hyper-vigilance. Van Gerven *et al.* (2016:5) related the severity of symptoms mentioned by Delacroix (2017:405) to the severity of harm caused to the patient by the adverse event (of which most respondents indicated to be medication errors). The harm done by the error had a strong correlation with the symptoms as measured by the Impact of Events Scale, showing $\beta = 9.78$ ($p < 0.001$) and $\beta = 6.75$ ($p < 0.001$) for incidents causing death or moderate harm to the patient respectively. The symptoms evaluated by the Impact of Events Scale included recurring thoughts, avoidance, insomnia, strong emotional reactions, denial, re-living the incident and emotional detachment or numbness.

Moving on to the next nursing outcome, three studies indicated a relationship between burnout and medication safety. Firstly, Nantsupawat *et al.* (2016:85) reported all three of the subscales of burnout to be associated with a perception of increased medication error incidence: Emotional exhaustion (Odds ratio = 1.47; CI = 1.13-1.96); Depersonalization (Odds ratio = 1.83; CI = 1.34-2.48); and Low personal accomplishment (Odds ratio = 1.49; CI = 1.13-1.96). Further logistic regression modelling showed that every unit of increasing emotional exhaustion score was associated with a 47% increased medication error reporting (Nantsupawat *et al.*, 2016:83). Van Bogaert *et al.* (2014:1125) agree with these findings, indicating that emotional exhaustion and depersonalization were predictors of medication errors with odds ratios of 1.39 and 1.68 respectively and statistically significant p-

values smaller than 0.001. Lastly, Wilson *et al.* (2017:199) describe the two-directionality of the relationship by stating that committing medication errors were significantly correlated with the personal accomplishment element of burnout (Odds ratio = 3.61; CI = 1.26-10.37; and $p = 0.017$).

Job satisfaction was the nurse outcome mostly explored in relation with medication safety. Although Bolandianbafghi *et al.* (2017:5142) could not find a significant relationship between job satisfaction and medication errors (effect size = 0.15, $p = 0.057$), this still shows a small effect with a borderline statistical significance that should not be disregarded. Chiang *et al.* (2017:359) and Kiyamaz and Koç (2017:3) present statistical evidence of the relationship between job satisfaction and medication errors ($r = 0.153$; $p < 0.01$ and Kruskal-Wallis = 11.84; $p = 0.054$). Other studies describe specific elements of job satisfaction to influence medication safety. Duffield *et al.* (2014:1292) explain that wards with a greater amount of nurses being forced to change from wards or a greater percentage of absenteeism also presented with more medication errors (50%, versus the average for all wards being 19.9%). Absenteeism was also mentioned by Paquet *et al.* (2013:82) as predictor of medication errors (effect size = 0.813, $p < 0.001$). Rezaiamin *et al.* (2017:9) and Shahrokhi *et al.* (2013:18) found lack of work commitment or lack of job interest to increase the incidence of medication errors. Rezaiamin *et al.* (2017:9) report $r = 0.25$ and $p = 0.006$ for this relationship, while Shahrokhi *et al.* (2013:18) explain that 92.6% of sampled nurses mentioned a lack of job interest to lead to medication errors ($n = 139$). Flipping the coin, Delacroix (2017:405) explains that committing a medication error leads to self-doubt, disappointment and feeling like a personal failure. This indicates a lack of feeling achievement and accomplishment of one's job values which is part of the definition of job-satisfaction.

The last nurse outcome under discussion, namely intent to leave, was mentioned by Paquet *et al.* (2013:82) as significantly correlated with medication errors (effect size = 0.41 and $p < 0.001$) while Delacroix (2017:405) relates a nurse's experience of feeling incompetent in continuing with the nursing profession, thus indicating a measure of intent to leave. Figure 3.3 summarizes the studies' results with consideration of the direction of the relationship between different nurse outcomes and medication safety.

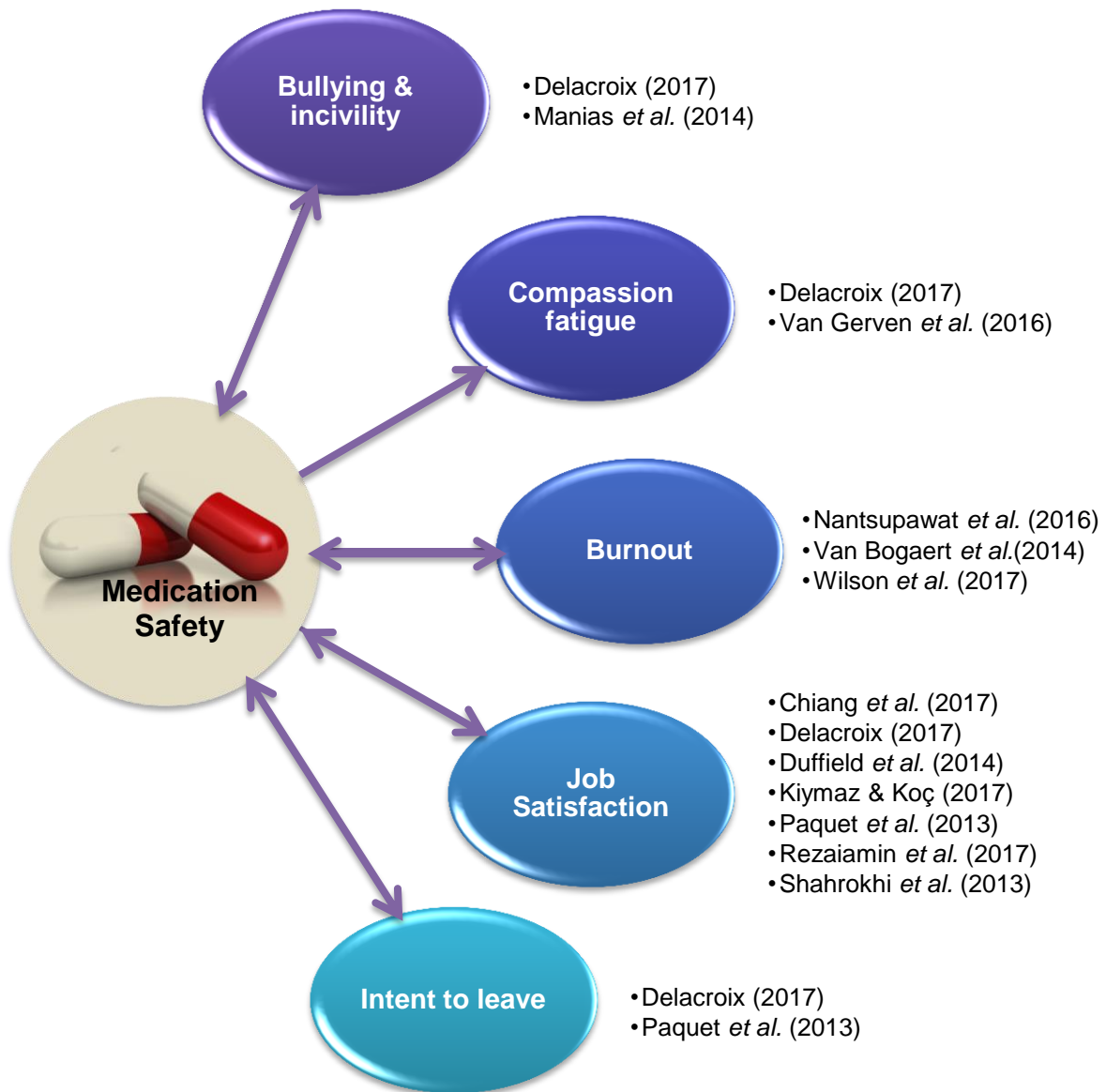


Figure 3.3 Thematic representation of studies' results indicating directional relationships between medication safety and nurse outcomes

It is evident that most research is focussed on the relationship of how nurse outcomes impact on medication safety, while only two studies reflect on the impact of medication errors on nurse outcomes. Notably, no included study explored the possibility of medication errors increasing due to nurses' experience of compassion fatigue. Also, most evidence relates to job satisfaction as impacting factor in medication errors, while other nurse outcomes' impact is not yet thoroughly described. The frequencies of evidence available of the relationship between medication safety and nurse outcomes as well as the frequencies of the different directions of these relationships are presented in figure 3.4. To note, the study of

Bolandianbafghi *et al.* (2017) was not included in the development of this figure, as this study did not support the notion that a relationship between medication safety and nurse outcomes exist while other studies such as that of Delacroix (2017) provided information on more than one nurse outcome.

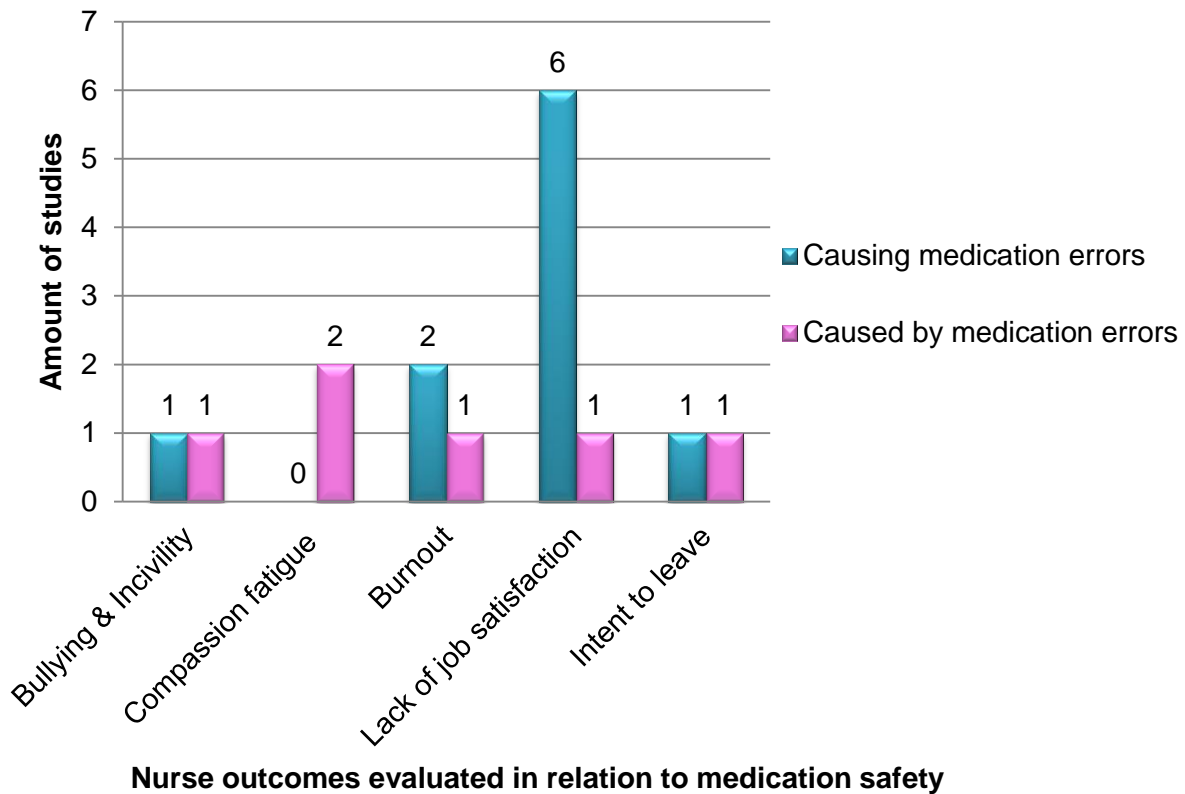


Figure 3.4 Frequency distribution of studies in relation to different nurse outcomes

In that limited comparable statistics were available, an attempt was launched to provide a summary of all statistical evidence retrieved from different studies in relation to the themes determined from qualitative analysis. These are presented in table 3.7. Markedly, the qualitative results of Delacroix (2017) were excluded from this summary, leading to one less study's findings being presented on the relationship between medication safety and bullying and incivility, compassion fatigue, job satisfaction and intent to leave. Pink highlighted relationships indicated that medication errors impacts negatively on nurse outcomes, while blue highlighted relationships indicated negative nurse outcomes lead to medication errors.

Table 3.7: Summary of statistical evidence from studies

Theme	Study	Statistical components
Bullying and incivility	Manias <i>et al.</i> (2014)	0.3% of respondents reported this cause
Compassion fatigue	Van Gerven <i>et al.</i> (2016)	$\beta = 9.78$; $p < 0.001$ (incidents causing death) $\beta = 10.69$; $p < 0.001$ (incidents causing severe harm) $\beta = 6.75$; $p < 0.001$ (incidents causing moderate harm)
Burnout	Nantsupawat <i>et al.</i> (2016)	OR = 1.47; CI = 1.05-2.07; $p < 0.03$. OR = 1.83; CI = 1.34-2.48; $p < 0.03$. OR = 1.49; CI = 1.13-1.96; $p < 0.03$.
	Van Bogaert <i>et al.</i> (2014)	OR = 1.39; CI = 1.20-1.60; $p < 0.001$. OR = 1.68; CI = 1.41-1.99; $p < 0.001$.
	Wilson <i>et al.</i> (2017)	OR = 3.61; CI = 1.26-10.37; $p = 0.017$.
Job satisfaction	Bolandianbafghi <i>et al.</i> (2017)	$r = -0.15$; $p = 0.057$.
	Chiang <i>et al.</i> (2017)	$r = 0.153$; $p < 0.01$. $\beta = 0.076$; $p < 0.001$
	Duffield <i>et al.</i> (2014)	A ward with a decrease of 4.0% & 9.4% in job satisfaction elements also showed 30.1% more medication errors.
	Kiyamaz & Koç (2017)	Kruskal-Wallis = 11.84; $p = 0.054$
	Paquet <i>et al.</i> (2013)	Effect size = -0.813, $p < 0.001$
	Rezaianin <i>et al.</i> (2017)	$r = 0.25$; $p = 0.006$. $\beta = -0.30$; $p = 0.006$.
	Shahrokhi <i>et al.</i> (2013)	92.6% of respondents mentioned this as cause of errors
Intent to leave	Paquet <i>et al.</i> (2013)	$r = 0.409$; $p < 0.001$

Some additional statistical syntheses of results were possible, especially with relation to the studies presenting inferential statistics. Firstly, a forest plot was construed from the studies presenting odds ratios to determine a general idea of what the odds of a potentiating effect between medication safety and burnout is, as only studies relating burnout provided odds ratios. The forest plot as presented in figure 3.5 provides the odds ratios of different aspects of burnout as causative of medication errors, while the Wilson *et al.* (2017) representation on the plot indicates the odds of medication errors contributing to nurses developing burnout. The diamond-shaped marker indicates the odds ratio of each element presented in

studies (where there were more than one element of burnout described in a study, these elements were presented as the study, numbered in sequence). The extent of the line indicates the 95% confidence intervals reported in the studies, on a logarithmic scale.

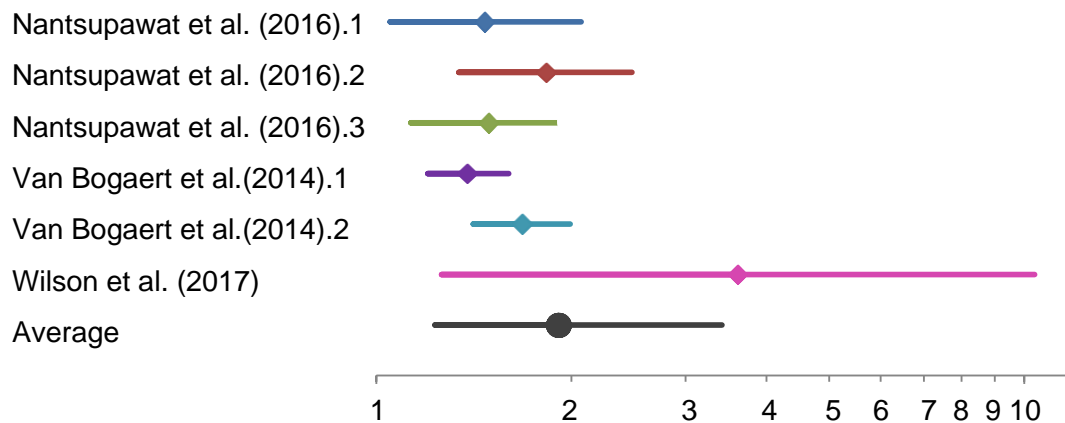


Figure 3.5 Forest plot indicating odds ratios for the correlation between medication safety and burnout

As most of the odds ratios revealed small correlations between medication safety and burnout, it was not surprising to note that the average odds ratio for the two-directional relationship between these variables was determined as 1.91 (small), with an average 95% confidence interval of 1.13 – 3.41. This is notably increased by the strong correlation between medication safety as a causative factor of burnout elements as presented by Wilson (2017), the odds ratio being 3.61, with a wide confidence interval. Thus, on average, the odds of developing elements of burnout after being involved in a medication error incident, or committing a medication error due to being burnt out, is almost twice as probable as for nurses that have experienced neither of these variables.

While not enough evidence was available to do comparative statistical analysis between medication safety and bullying and incivility, beta coefficients from regression analyses and effect sizes between medication safety and compassion fatigue elements, job satisfaction elements and intent to leave were compared. Firstly, beta coefficients derived from compassion fatigue and job satisfaction subscales were described. Figure 3.6 presents the comparison between beta coefficients as derived from included studies. Markedly, while these coefficients revealed strong evidence of relationships between medication safety and

compassion fatigue, the relationship between medication safety and job satisfaction elements was not supported by this evidence. The red line shows the level at which the effect of one variable could influence another. Anything above one supports such a relationship.

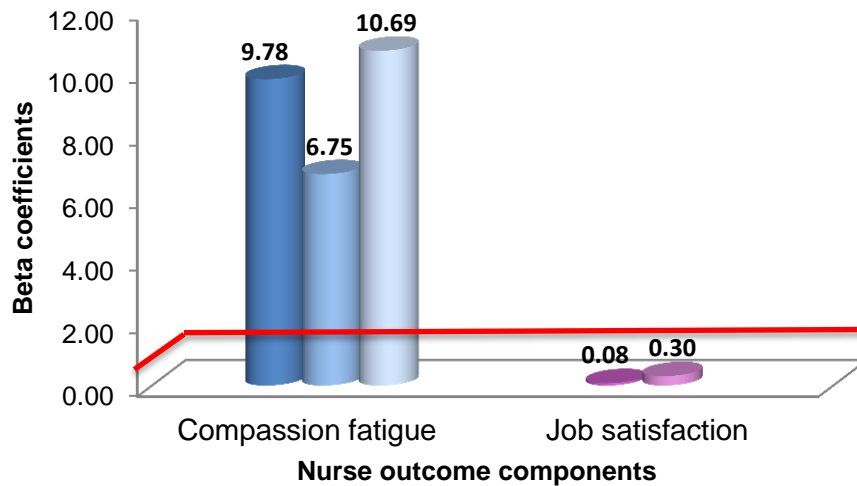


Figure 3.6 Comparison of Beta coefficients for compassion fatigue and job satisfaction subscales

Lastly, the effect sizes of medication safety with job satisfaction elements and intent to leave were compared. Figure 3.7 presents this comparison. The red line indicates the level of practical significance at 0.5, while 0.1 and 0.3 indicates small and medium effect sizes respectively, indicated by lighter red lines.

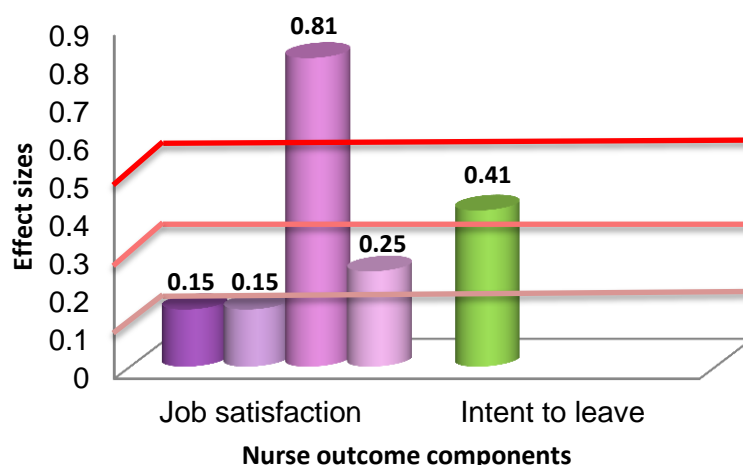


Figure 3.7 Comparison of effect sizes for job satisfaction and intent to leave subscales

Only one practically significant effect size was reported for one of the elements of job satisfaction's relationship with medication safety. Although the relationship between intent to leave and medication safety revealed a large effect size (0.41), it was not practically significant at above 0.5. However, important to note is that all inferential statistics aimed at determining relationships between medication safety and nurse outcomes showed statistical significance to the findings, with p-values below 0.05, except for two borderline statistical significances. Firstly, the relationship between medication safety and job satisfaction was only borderline statistically significant with $p = 0.057$, while Kiyamaz and Koç (2017) reported 0.054 as p-value for the relationship between job satisfaction and medication safety.

Although insight into the two-directional relationship between medication safety and nurse outcomes were derived from the data synthesis, the need for simplification of themes were deemed necessary in order to create a viable and easily presentable plan to managers for improving patient and nurse outcomes in their facilities. For this reason, three mega-themes to be addressed were determined by further thematic content analysis, namely Inner conflict (compassion fatigue and burnout); Relational conflict (incivility and bullying); and System conflict (lack of job satisfaction and intent to leave). These mega-themes were imposed on the Patient Safety Model for Healthcare as presented by Emanuel *et al.* (2008:15) previously introduced under the theoretic framework of the study (Section 1.7.). Figure 3.8 reveals the fit of the mega-themes in this model.

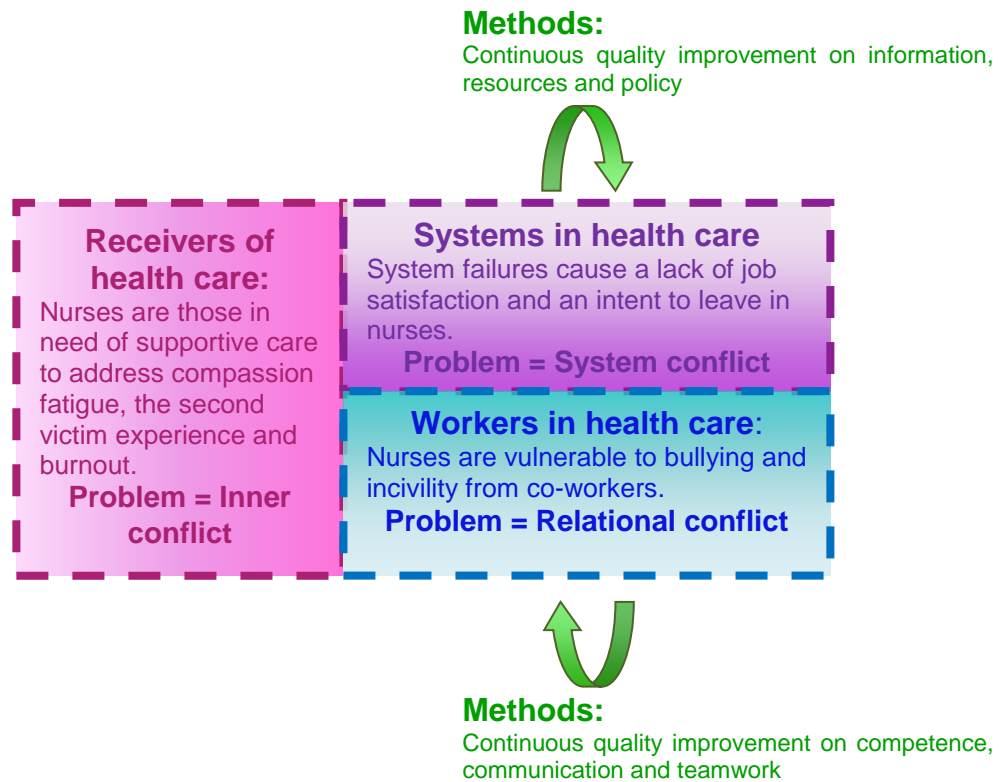


Figure 3.8 Inner conflict, relational conflict and system conflict as imposed on the Patient Safety Model for Health Care

Discussion of results by means of correlation with supportive literature and introduction of managerial implications for continuous quality improvement on the three mega-themes follows.

3.5 DISCUSSION OF RESULTS

The discussion to follow will ensue with the supportive literature for the relationship between medication error and nurse outcomes. Afterward, the three mega-themes with suggestions for improving the conflict nurses experience within themselves, within relationships and within systems were presented.

3.5.1 Supportive literature for the two-directional relationship between medication safety and nurse outcomes

Berry *et al.* (2016:337), Hamblin *et al.* (2015:2458), Laschinger (2014:284) and Tee *et al.* (2016:30), confirmed the findings of this study by agreeing that bullying and incivility impact on medication safety, as was also mentioned by the included study conducted by Manias *et al.* (2014:74). Malone (2016:157) expands on the reason for this medication safety risk in that 40% of nurses had previously assumed a

questionable medication order was correct or asked another person to speak to the prescriber in their place to avoid confrontation, while one third did not question an order they felt uncomfortable about. The fear of being bullied thus lead to assumptions that could put the patients' safety at risk.

On the other hand, mistakes made by nurses sometimes lead to being bullied or experiencing uncivil behaviour. Delacroix (2017:405) reports nurses feeling victimised and judged after committing an error. Physicians are more often implicated for uncivil behaviour and pointing out mistakes, probably because the medical culture has a history of tolerance or indifference to this and/or because organizations tend to treat doctors differently from other staff (Joint Commission, 2008).

No included studies reflected that compassion fatigue influenced medication safety. However, some studies that have not been included due to them reporting general adverse events and not only medication errors did reveal a relationship to exist between compassion fatigue and adverse events (which might include medication errors). Berger *et al.* (2015:e11) mention that compassion fatigue in nursing impacts the overall quality of patient care while Maiden *et al.* (2011:339) report that compassion fatigue increases nurses' perceptions of medication errors incidence.

On the other hand, several other studies report the physical, emotional, social and cognitive symptoms similar to that of compassion fatigue after committing an error (Ajri-Khameslou *et al.*, 2017:68; Rassin *et al.*, 2005:873 and Treiber & Jones, 2010:1327). Thus then, the findings of Delacroix (2017:405) were supported. Van Gerven *et al.* (2016:5) explain that the severity of these symptoms is often related to the severity of harm experienced by the patient.

Literature furthermore agrees that burnout is significantly associated with higher levels of nurse-reports of poor quality of care (Poghosyan *et al.*, 2010:288). This is in correlation with the outcomes of this review, supporting the findings of Nantsupawat *et al.* (2016:85) and Van Bogaert *et al.* (2014:1125).

Conversely, Wilson *et al.* (2017:199) describe the two-directionality of the relationship by stating that committing medication errors might contribute to developing burnout. Scholes (2013:263) also explains that other confounding

factors, such as being blamed or criticized by others for making mistakes, relate to a higher risk of experiencing burnout.

Crigger and Meek (2007:177), McHugh and Stimpfel (2012:566) and You *et al.* (2013:154) agree with the predominant findings of this study that job-satisfaction often is implicated for medication errors. In this study, Chiang *et al.* (2017:359), Duffield *et al.* (2014:1292) and Kiyamaz and Koç (2017:3) introduced this notion, while Paquet *et al.* (2013:82), Rezaiaimin *et al.* (2017:9) and Shahrokhi *et al.* (2013:18) focused on specific elements of job satisfaction such as absenteeism, work commitment or job interest in relation to medication safety.

Providing the flip-side of the argument, Delacroix (2017:405) found that committing a medication error led to self-doubt, disappointment and feeling like a personal failure. This indicates a lack of feeling achievement and accomplishment of one's job values which is part of the definition of job-satisfaction. This argument is supported by McHugh and Stimpfel (2011:566) and You *et al.* (2013:154) who found significant relationships between lower job satisfaction and negative patient outcomes such as medication errors. Crigger and Meek (2007:177) further elaborate on job-dissatisfaction in stating that nurses who previously made an error loses confidence in their professionalism, feeling inadequate and shameful in the workplace.

Related to the loss of confidence in professional ability as mentioned above and also by Rassin *et al.* (2005:873), nurses start to question their abilities to act as a nurse (Treiber & Jones, 2010:1327) and therefore consider leaving their employment. Paquet *et al.* (2013:82) mention intent to leave as significantly correlated with medication errors. Van Mol *et al.* (2015:1) agree that quality of patient care is seriously compromised by healthcare professionals leaving their jobs prematurely in order to preserve their own health.

Committing medication errors also leads to the intent to leave the profession. Delacroix (2017:405) relates a nurse's experience of feeling incompetent in continuing with the nursing profession, thus indicating a measure of intent to leave while Schelbred and Nord (2007:317) relate a nurse's experience of making an error as betrayal of their patients and colleagues. While Ajri-Khameslou *et al.* (2017:68) report that these feelings add to the nurse's reluctance to repeat tasks that

previously led to mistakes, Schelbred and Nord (2007:317) recount an example of a participant who left the profession as she felt she could not be a nurse anymore.

In addressing nurse outcomes, managers will ultimately address medication safety, as better nurse outcomes will lead to better medication safety, which will in turn snowball to better nurse outcomes. This statement is confirmed by the above discussion of the two-directional relationships between medication safety, bullying and incivility, compassion fatigue, burnout, job satisfaction and intent to leave. To then address these nurse outcomes, managerial implications aimed at nurses' inner conflict (compassion fatigue and burnout), relational conflict (bullying and incivility) and system conflict (lack of job satisfaction and intent to leave) should be developed.

3.5.2 Managerial implications: Addressing nurses' inner conflict

After a patient safety incident, such as a medication error, nurses seek social support. Seys *et al.* (2012:154) propose that these nurses talk to someone about feelings, accept sympathy and understanding from someone, or ask a relative or a friend for advice. Engel *et al.* (2006:86) found that talking with family and friends is less important in the coping process than talking with medical colleagues. For these reasons, managers should be available for discussion of medication errors, or appoint a colleague to be available to debrief nurses after such an incident. Ultimately the best for nurses would be if they should have the option to talk to both the manager and a peer, as Chard (2010:132) and Shannon *et al.* (2009:317) differentiate between the importance of both unit manager and peer support for nurses. Furthermore, Scott *et al.* (2010:233) proposed both informal and formal support from peers and formal support away from direct patient care, and include counselling as another intervention to be considered.

Taking responsibility for the mistake is another important strategy in coming to terms with emotions and also in avoiding future errors (Goldberg *et al.*, 2002:287). A part of taking responsibility is meeting with the patient or the family, which might provide relief or absolution (Aasland & Førde, 2005:13; Berlinger & Wu, 2005:106; and Denham, 2007:107). Moreover, disclosure of preventable adverse events was also related to decreased emotional exhaustion and depersonalization, thus addressing more than only one negative nurse outcome (Lewis, *et al.*, 2015:150) and thereby greatly mitigating the nurse's inner conflict. However, the National Quality Forum

(2010) suggests a formal process wherein facts are provided to patients and nurses are trained on how to disclose these errors to patients. Following this, Shannon *et al.* (2009:318) perceive a team-based error disclosure system to be most successful.

Not only do nurses need training on how to disclose errors to patients, but Mira *et al.* (2015:151) also express the need for health professionals to receive training and education on coping strategies. Adding to learning coping strategies, Kravits *et al.* (2010:130) reported some success in preventing negative nurse outcomes by learning relaxation techniques and using art to express feelings. However, not only is learning coping strategies to deal with compassion fatigue important, but so is affirming a nurses who committed medication errors' clinical abilities (Scott. *et al.*, 2008:38). This affirming could be accomplished by re-training and further education.

Moving on to the problem of burnout, Akella and Kabay (2007:2) mention a few strategies in preventing burnout in employees, viz. ensuring autonomy for the employee with increased ownership and responsibility, and supporting employee efforts and providing recognition for good work. Autonomy can be increased by building nurses' clinical competence, while increasing ownership and responsibility is also a strategy aimed at limiting compassion fatigue as discussed in the previous paragraph. Furthermore, supporting employee efforts could be seen as another form of affirming a nurse's clinical abilities. De Gieter *et al.* (2006:15) and Seitovirta *et al.* (2016:1042) agreed that appreciation and compliments from others were very highly valued by nurses. They compared the value of appreciation and complimenting to that of financial rewards (De Gieter *et al.*, 2006:15). Thus, appreciation, complementing and rewarding are all seen as affirming strategies built forth from the previous theme in this mega-theme. This overlap affirms the credibility of the mega-themes developed.

3.5.3 Managerial implications: Addressing nurses' relational conflict

International research reports verbal abuse towards professional nurses as a common or even daily problem (Jackson *et al.*, 2013: 2066; Truman *et al.*, 2013:6; and Stone *et al.*, 2010:1365), and this was validated by South African respondents viewing uncooperative patients as being a major contributing factor to medication errors (Blignaut, 2015:162). Due to the highly distressing nature of verbal abuse, nurses might tend to withdraw from the care of a verbally abusive patient, thereby

leading to medication administration errors (Stewart & Bowers, 2013:236; and Stone *et al.*, 2010:1365), especially omissions or wrong-time errors. Malone (2016:159) states that nurses should be taught how to handle unacceptable behaviour and that they should be empowered to report potentially disruptive conduct without fear of reprisal. Related to being able to report disruptive conduct, the Institute for Safe Medication Practices ([ISMP], 2014:158) suggests allowing confidential reporting.

The ISMP (2014:158) further suggest the establishment of an escalation policy to facilitate conflict management and resolution between staff, while promoting open dialogue. A zero tolerance towards incivility should be enforced. However, in managing conflict and misconduct, a punitive response might not be the best option.

The punitive response from managers and physicians add to the uncivil environment nurses have to work in. This goes against the just treatment as suggested by Denham (2007:107) required in assisting nurses dealing with a patient safety incident. More than half of respondents from a study conducted by Toruner and Uysal (2012:32) mentioned that being blamed if something happened to a patient is the number one reason for not reporting a medication error. This fear thereby increases the risk of a patient experiencing serious harm from such an error as it cannot be reversed or attended to adequately if it is not divulged. Blame from the patient or the physician is not the only consideration in reporting errors, as Blignaut (2015:169) also found the fear of management's response as preventing them from reporting errors. Such intimidation experienced by nurses could be due to bullying or uncivil behaviours displayed towards them.

In addressing bullying and incivility, workplace civility training does not only help to alleviate bullying and incivility, but also improves other negative nurse outcomes such as burnout (Maslach *et al.*, 2012:296). Civility training helps to build high quality, respectful professional relationships in the workplace (Leiter *et al.*, (2012:425).

Continuing on the topic of professional relationships, teamwork is another important facet of safety culture. The lack of teamwork within a unit is seen as a very important issue leading to nursing errors (Mahmood *et al.*, 2011:233). Malone (2016:159) advocates that everyone involved in the care of patients should be

educated on what supports teamwork and a pleasant work environment, while the ISMP (2014:158) encourages managers to lead by example in this regard and also to reward positive behaviour. This does not only address relational conflict, but also serve as conducive to staff recruitment and retention.

3.5.4 Managerial implications: Addressing nurses' system conflict

As other nurse outcomes such as bullying and incivility, compassion fatigue and burnout impact directly on job satisfaction (Cicolini *et al.*, 2014:855), addressing those issues as proposed in the previous two sections should also mitigate a lack of job satisfaction and intent to leave greatly.

Facilitating job satisfaction will mitigate intent to leave. However, if a nurse is unhappy at work, he/she will look for a way out of that employment. Larney *et al.* (2014:1033) emphasize the complexity of attaining job satisfaction in nurses, mentioning that healthcare settings need a combination of interventions to help increase retention of their nurses.

Conversely, nurses leaving the profession add to the existing nurse shortage problem (Force, 2005:336), which in turn increase the workload of remaining, already overworked nurses. While workload impacts on the job satisfaction of nurses, it also impacts on medication safety. If reasonable workloads exist, nurses are less likely to participate in unsafe behaviour when administering medications (Fogarty & Mckeon, 2006:454). Mahmood *et al.* (2011:233) and Al-Shara (2011:159) agreed that work overload was the top organizational issue leading to nursing errors. An increase in the involvement of errors then snowballs back to create more negative nurse outcomes, with increased lack of job satisfaction.

While work circumstances with relation to workload and staffing levels might not change in the near future, leaving managers powerless in addressing this problem, Force (2005:336) proposes three retention-building elements managers could do something about. These include promoting nurses' autonomy, increased accountability and shared governance. Bauer *et al.* (1993:39) already introduced these elements more than two decades ago.

The subject of teamwork such is addressed here in the form of shared governance, was already addressed in initiatives aimed at achieving lower relational conflict (section 3.5.3). Mohr *et al.* (2008:23) confirm that better team-relations within institutions increase job satisfaction among nurses. The notion of increasing nurses' autonomy reflects the need for nurses to be seen as equal partners within the health-care team. Meraviglia *et al.* (2008:305) confirm that including nurses in the management of the hospital builds on the "magnet hospital" concept, which indicates that nurses are attracted to work in such hospitals. To expand on nurses being involved in hospital management, Boss *et al.* (1989:140) and Shahrokhi *et al.* (2013:18) propose that nurses should be able to confront hospital management with problems experienced at ground level in order to identify solutions for these problems together.

Cowden *et al.* (2011:461) turn the attention to the individual nurse's job satisfaction in suggesting that managers should take time to know and meet the individual's needs in order to foster their intention to stay. This correlates with the specific support previously mentioned in managers' responsibility to help the nurse to resolve their inner conflict after a patient safety incident (section 3.5.2). Also related to addressing inner conflict issues, Bauer *et al.* (1993:39) reiterated the importance of reward and recognition in increasing job satisfaction of nurses. Meraviglia *et al.* (2008:307) indicate that recognition could take the form of competitive wages, or even personal development opportunities.

Considering the two-directional relationship between medication safety and nurse outcomes, several suggestions have been provided for managers to build the safety culture of their institutions. A safety culture is a characteristic of high-reliability organizations that are commonly advocated as the foundation of quality care and patient safety (Pham *et al.*, 2012:451). Here, nurses' safety was also considered.

3.5.5 Summary of managerial implications derived from the relationship between medication safety and nurse outcomes

In the previous sections, several managerial implications overlapped in addressing nurses' inner-, relational- and system conflict. In addressing one conflict area, another was at times also inadvertently addressed. Overlaps were identified and a

five-themed approach for mitigation of the potentiating effect between medication errors and negative nurse outcomes were developed.

The five elements to be addressed by managers include resolution efforts, affirmation, teamwork, training and social support. All of these elements should be addressed on all three mega-themes' levels. The five elements could also be imposed on the Patient Safety Model for Health Care as used as theoretical framework for this study: Methods for continuous quality improvement on competence, communication and teamwork can be directly equated to the training and teamwork aspects of the model, while methods for continuous quality improvement on information, resources and policy could be linked to resolution efforts (information sharing between nurses and patients or nurses and managers), and social support (human resources), while policies should be developed to address all of these elements.

Figure 3.9 provides a summary of the five elements to be addressed by nursing managers within the three mega-themes defined. Elements indicated in red constitute those aimed at nurses' inner conflict, elements in blue indicated addressing of relational conflicts and elements in green present actions to mitigate nurses' conflict with systems.

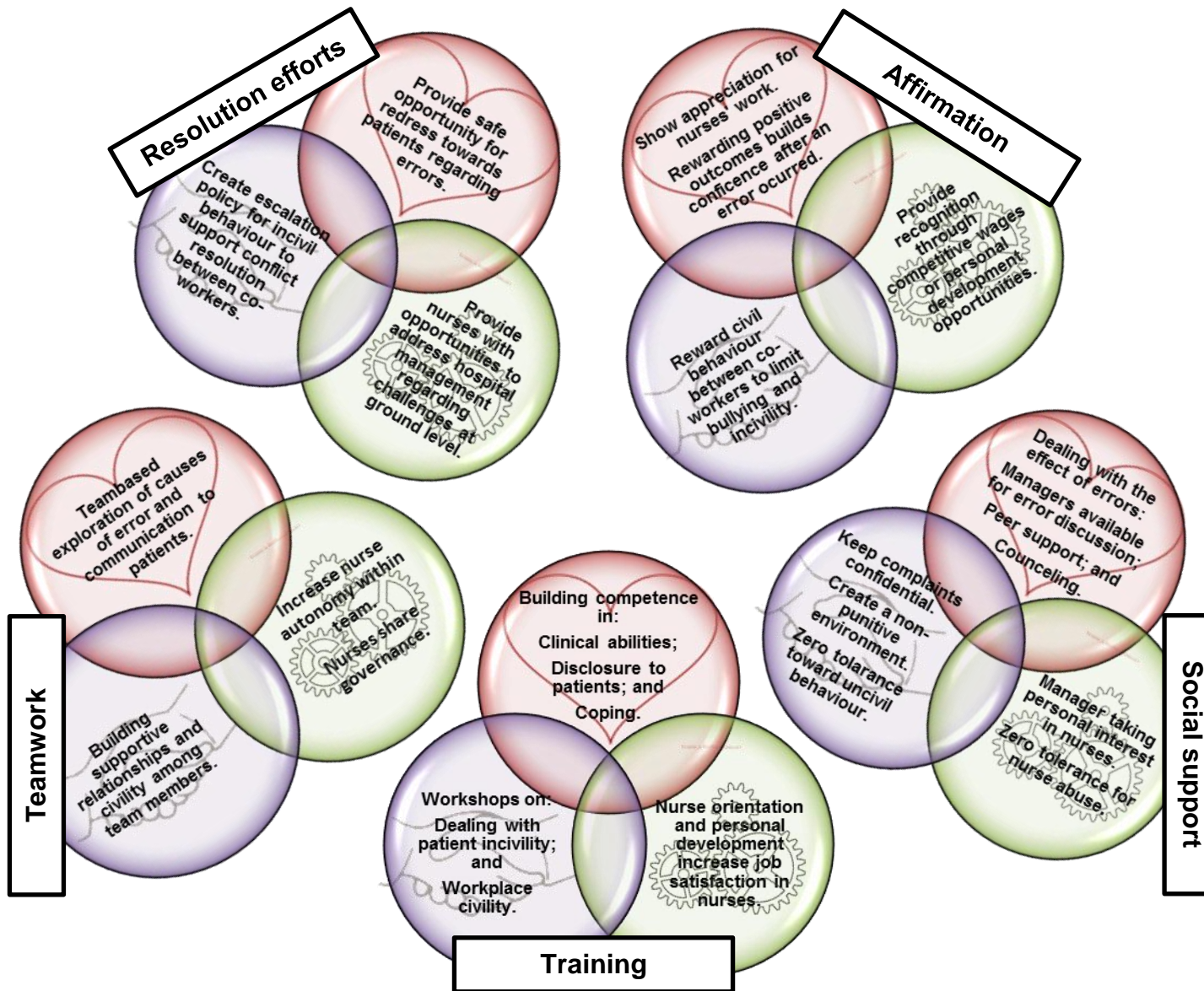


Figure 3.9 Managerial implications to mitigate the potentiating medication safety versus nurse outcome relationship

3.6 SUMMARY

In this chapter, the results of the study were presented. Studies derived from the search strategy were described and appraised for quality, where after applicable findings were extracted from them. Results were thematically analysed, then quantified and statistical synthesis of results was presented. Three mega-themes to be addressed by managers were identified and discussed, ending off the chapter with a summary of nurse implications to mitigate the potentiating effect between medication safety and nurse outcomes.

In the last chapter of this dissertation, an evaluation of the study, recommendations derived from the study and limitations noted during the study will be provided.

CHAPTER 4 – STUDY EVALUATION, LIMITATIONS AND RECOMMENDATIONS

4.1 INTRODUCTION

The first three chapters of this dissertation provided an overview of the study, the study method and results derived from the study. In this last chapter, a summary of evidence derived from this study is presented. The study is also evaluated to ensure that all objectives were achieved. Recommendations for nursing management, policy, nursing practice and further research were developed. Lastly, limitations of the study were discussed along with mitigating factors.

4.2 MAIN FINDINGS OF THE STUDY

The two-directional relationship between medication safety and all nurse outcomes except for compassion fatigue was supported by the findings. Although the two-directionality of the medication safety and compassion fatigue relationship was supported by literature not included in the systematic review results, results of this study showed that medication errors contribute to causing symptoms of compassion fatigue. In determining managerial implications from these results, three mega-themes for the manager to focus on in mitigating the effects of medication errors and negative nurse outcomes were identified, namely nurses' inner conflict, nurses' relational conflict and nurses' system conflict. Five elements should be addressed by managers to better both medication safety and nurse outcomes, viz. resolution efforts, affirmation, teamwork, social support and training.

4.3 EVALUATION OF THE STUDY

This study was evaluated, firstly by investigating whether the objectives were achieved, and secondly by determining whether all elements as presented by the PRISMA checklist for a well-formulated systematic review were addressed.

The primary objective of this study was to derive managerial implications for the improvement of medication safety and nurse outcomes by exploring and describing the relationship between negative nurse outcomes and medication errors.

To address this primary objective, the following secondary objectives were set:

- To review recent evidence on the impact of negative nurse outcomes on medication errors;
- To review recent evidence on the impact of medication errors on negative nurse outcomes; and
- To present management implications for the betterment of medication safety and nurse outcomes in health-care facilities.

In addressing the first objective, ten articles published between 2013 and 2017 were reviewed to determine the impact of negative nurse outcomes on medication errors. All ten of these studies explored this relationship quantitatively, and nine of these studies concluded that negative nurse outcomes cause lapses in medication safety, while one presented borderline significance in its findings. Nurse outcomes impacting on medication safety included bullying and incivility, burnout, job satisfaction and intent to leave.

Three articles presented evidence that medication errors negatively impacted on nurse outcomes, thus addressing the second objective. Two of these articles presented statistical evidence to support their findings, while one was a qualitative study. Although limited research on this direction of the relationship between medication safety and negative nurse outcomes were available, evidence extracted from these three articles indicated that all negative nurse outcomes measured in this study (bullying and incivility, compassion fatigue, burnout, lack of job satisfaction and intent to leave) were impacted by nurses committing medication errors.

From the synthesis of results attained in addressing the first two objectives, three mega-themes for managers to consider were derived and addressed to present managerial implications for betterment of medication safety and nurse outcomes. Thus, objective three was sufficiently addressed.

The study was further evaluated by comparing elements thereof with the PRISMA checklist (Addendum 1), as this checklist is respected by several peer-reviewed journals as the gold standard for systematic reviews. The elements required by the checklist, together with referral to sections in the study were presented in table 4.1 to provide an overview of the compliance of this review with the named requirements.

Table 4.1: Evaluation of study according to the PRISMA checklist

Section / topic	Checklist item	Section	Comments
Title			
Title	Identify the report as a systematic review, meta-analysis, or both.	Abstract	Although not identified in the title, it is identified as a systematic review in the abstract.
Abstract			
Structured summary	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	Abstract	All of the required information was provided in the abstract, although a systematic review registration number was not yet available at the time of submission.
Introduction			
Rationale	Describe the rationale for the review in the context of what is already known.	1.1 Background	Done
Objectives	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	1.6 Objectives	Done
Methods			
Protocol and registration	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	Chapter 1	Chapter one of the study present the review protocol, an overview of the study. As discussed previously, the registration information was not yet available.

Section / topic	Checklist item	Section	Comments
Eligibility criteria	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	1.9.2 Search strategy phase 2.2.1.1 Identifying the problem 2.2.2.1 Locate relevant literature 2.2.2.2 Selecting studies	Done
Information sources	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	1.9.2 Search strategy phase 2.2.2.1 Locate relevant literature	Done. Contact with authors was not required and thus not discussed.
Search	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	1.9.2 Search strategy phase 2.2.2.1 Locate relevant literature	Search study described at length.
Study selection	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	1.9.2 Search strategy phase 2.2.2.2 Selecting studies 2.2.2.3 Investigate the quality of the study	Done.
Data collection process	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	1.9.3 Data collection phase 2.2.3 Data extraction	Data extraction limited to findings relevant to this review. No confirmation from investigators was deemed necessary.
Data items	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	1.9.2 Search strategy phase 2.2.2.2 Selecting studies	Done. Funding, assumptions and simplifications were not required.

Section / topic	Checklist item	Section	Comments
Risk of bias in individual studies	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	1.10.1 Risk of bias in individual studies	Done
Summary measures	State the principal summary measures (e.g., risk ratio, difference in means).	1.9.4 Data synthesis phase 2.2.4 Data synthesis	Done, although several comparative measures were used due to the different statistical methods employed across studies.
Synthesis of results	Describe the methods of handling data and combining results of studies, if done, including measures of consistency	1.9.4 Data synthesis 2.2.4.1 Combine findings of the systematic review	Done
Risk of bias across studies	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	1.10.2 Risk of bias across studies	Done
Additional analyses	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	3.5.5 Summary of managerial implication derived from the relationship between medication safety and nurse outcomes	Discussion of managerial implications led to themes being derived in the form of elements to be addressed by managers. This analysis was not pre-specified.

Section / topic	Checklist item	Section	Comments
Results			
Study selection	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	3.2.1 Outcome of search	Done
Study characteristics	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	3.2.2 Quality of studies obtained	Done
Risk of bias within studies	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	1.10.1 Risk of bias in individual studies	Mitigation of these risks were adequately discussed in chapter one, although one study's statistical data which did not declare a small effect size between medication errors and job satisfaction was noted and discussed.
Results of individual studies	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	3.3 Data extraction 3.4 Synthesis of results	Evidence on only one nurse outcome, namely burnout, presented enough information for the creation of a forest plot.
Synthesis of results	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	3.4 Synthesis of results	Results were synthesized by thematic content analysis and limited statistical analyses.
Risk of bias across studies	Present results of any assessment of risk of bias across studies (see Item 15).	1.10.2 Risk of bias across studies	Mitigation of these biases was adequately addressed in chapter 1. No such biases were noted during data analysis.

Section / topic	Checklist item	Section	Comments
Additional analysis	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	3.5.5 Summary of managerial implication derived from the relationship between medication safety and nurse outcomes	The outcome of additional thematic analysis of elements to be considered by managers was provided, though this analysis was not discussed in detail.
Discussion			
Summary of evidence	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	3.5 Discussion	Done. Implications for nursing managers were highlighted. Further recommendations were presented in the last chapter.
Limitations	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	4.5 Limitations	Done
Conclusions	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	4.6 Conclusion	Done
Funding			
Funding	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	n.a.	No funding sources to be declared were relevant to this study.

4.4 RECOMMENDATIONS

Several recommendations were derived from this study and will now be presented. These will include recommendations for nursing management, for policy, for nursing practice, nursing research and nursing education.

4.4.1 Recommendations for nursing management

The following recommendations for nursing management were derived from the study:

- Present social support to nurses by being available to talk about medication errors and how nurses experience the aftermath of such errors;
- Appoint a nurse to act as peer support for nurses who committed a medication error and need to talk about it. The availability of such service from the relevant peer should be communicated to all nurses working in the facility;
- Negotiate with hospital management to provide counselling services by a professional person after the occurrence of a medication error that might have caused harm to the patient;
- Ensure confidentiality of nurses reporting disruptive behaviours from physicians or other co-workers. This could be done by anonymous notes posted regarding a specific incident;
- Create a non-punitive environment where the nurse could feel safe to report a medication error and know that both the patient and him/herself will be taken care of to ensure minimisation of the effects of such an error;
- Create and communicate a policy of zero tolerance towards incivility in the workplace. This could be done by enforcing fines or written warnings for such behaviours;
- Take personal interest in nurses and make a point of having monthly conversations with each individual nurse to evaluate their psychological health and level of coping with their workload and work environment;
- Address abuse from patients immediately. This could be done by removing a specific nurse from service of that patient, by providing psychological support

for disruptive patients or by enforcing sedation if the patient's condition merits it;

- Provide support and opportunity for nurses in admitting to mistakes to patients and families;
- Provide an open-door policy for conflict resolution issues among staff;
- Facilitate meetings between hospital board members and representatives from each ward to discuss challenges experienced by nurses and their suggestions on how management could address these challenges;
- Provide training to nurses on how to disclose errors to patients and families, and how to cope with the feelings after being involved in a medication error;
- Ensure that there are opportunities for nurses to update their skills by attending workshops or in-service training sessions;
- Launch a compulsory hospital-wide workplace civility training course. This could be completed on-line to take into account different working schedules of health care professionals;
- Provide new nurses with orientation and training on all above training recommendations;
- Show appreciation towards the workforce for coping with high workloads, even if it is only by attending a hand-over once every month and thanking the nurses for being there;
- Establish a “nurse of the month” programme to reward quality patient care;
- Establish a “physician of the month” programme to reward civil behaviours towards nurses;
- Negotiate for competitive wages for nurses from management;
- Discuss case studies of medication errors with all representatives from the multi-disciplinary team to identify system flaws and solutions to these errors;
- Try to implement teamwork-building activities between nurses and physicians on small scale, such as taking ten minutes each month to paint a picture on a childrens' ward wall or to complete a puzzle together; and
- Negotiate for an increase in the representation of nurses on the executive board of the hospital.

4.4.2 Recommendations for policy

The following policies should be developed following the results of this study:

- In addressing uncivil behaviour between co-workers, a policy for reporting such behaviour as well as an escalation plan for continuation of such behaviour should be developed. This policy should also involve uncivil behaviour by patients and how it should be dealt with;
- A policy should also be established for the protocol to follow after a medication error occurred, not only to report the error and minimise the risk to the patient, but also to provide support to the second victim, the nurse who committed the error. This policy should include non-punitive response to an error, divulging the incident to the patient or family, being supported by a dedicated peer member, being offered counselling and also the opportunity for retraining of clinical skills if the nurse should request such training;
- A transparent policy on reward in the form of competitive wages should be made available to nurses;
- Managers should take responsibility for the work-related health of the nurses working under them. To this end a policy on how to assess and address negative nurse outcomes should be developed for the six-monthly assessment of nurse outcomes; and
- Training schedules should be standardised and fair, providing a clear outline for how to apply for professional development opportunities.

4.4.3 Recommendations for nursing practice

The following nursing practice recommendations are relevant:

- Nurses should report medication errors when they occur and seek support from managers and peers in dealing with the error and the impact thereof on him/herself;
- Nurses should provide each other with support and understanding and assist in double-checking of high-alert medications in order to minimise medication errors;
- Nurses should confront doctors on illegible or unclear prescriptions in a civil and respectful manner;

- More experienced nurses should supervise students and novice nurses during medication rounds and also incorporate in-service training to prevent medication errors; and
- Nurses should report uncivil or bullying behaviour, even if they are only witnesses to such behaviour.

4.4.4 Recommendation for nursing research

The limited research on the area of focus of this study present gaps to be filled by continued research:

- More qualitative research on the experiences of nurses after a medication error occurred is needed, as most of these qualitative inquiries are focussed on general adverse events and not medication errors in particular;
- Quantitative research with strong statistical support on the influence of negative nurse outcomes on medication errors is important to finally shift the blame for medication errors from nurses to systems, as currently the victims of the system flaws are being blamed for these errors;
- The two-directionality of the relationship between medication safety and nurse outcomes should be researched in more detail, indicating which elements of medication safety and which elements of nurse outcomes have the greatest potentiating effects in order to prioritise intervention attempts;
- Research on the influence of interventions aimed at improving nurse outcomes should also measure the influence this has on medication safety; and
- Resources on nurse and system characteristics that mitigate medication errors should be investigated, as most research on medication safety is aimed at causes rather than solutions to the problem.

4.4.5 Recommendation for nursing education

The last set of recommendations flowing from this study includes recommendations for nursing education:

- Nursing students should be prepared to face medication errors and should be taught not only how to prevent them, but also how to deal with these errors

when they occur. Currently, nursing education focuses on the rights of medication administration, but what course of action to follow after a medication error has been committed is neglected in this education;

- Training of nurses in dealing with medication errors, both in reporting them, and dealing with the personal consequences experienced should be incorporated in workshops;
- Nurses should be taught how to be assertive in response to bullying or intimidating behaviour. Conflict resolution should be taught instead of avoidance; and
- Better pharmacological preparation of students is required to better prepare these students for clinical practice.

4.5 LIMITATIONS

Some limitations to this study have been identified and are now presented:

- There is more literature available on nurses' experiences of general adverse events (not focussed on medication safety). Relevant experiences and outcomes of medication errors could have been left unexplored due to the limitation of nurse outcomes related specifically to medication errors, as the experiences might be the same for all adverse events. This is confirmed by articles that reported on the effect of all adverse events, revealing that medication errors is one of the most-often cited adverse events reported by nurses. However, the results from the study were correlated with other studies and confirmed, thus the outcome of the study in exploring the relationship between medication errors and nurse outcomes were achieved;
- Limited studies were available on the influence medication errors exert on nurse outcomes, which could have led to the assumption that the impact of medication errors on nurse outcomes are less important than the impact of nurse outcomes on medication errors. The two-directionality of this relationship was emphasised and supported by literature in order to limit this assumption; and
- Relevant studies were excluded because of being published before 2013. In retrospect, considering the limited amount of studies available on the topic, an

extension on the publication time line might have increased the rigour of the study.

4.6 CONCLUSION

A systematic review to investigate the two-directionality of the relationship between medication safety and nurse outcomes was launched. After a background to the study was provided, the research method was described at length. Results confirmed the investigated relationship and lead to development of managerial implications focused on three mega-themes namely nurses' inner conflict, nurses' relational conflict and nurses' system conflict. Five elements were discussed as important in addressing these three mega-themes: resolution efforts, affirmation, teamwork, social support and training. It is concluded that in caring for the nurse, managers truly care for patients in that mitigating negative nurse outcomes will also cause a decline in nurse-related medication errors.

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ADDENDUM 1: PRISMA checklist

Section/topic	#	Checklist item	Reported on page #
TITLE			
Title	1	Identify the report as a systematic review, meta-analysis, or both.	
ABSTRACT			
Structured summary	2	Provide a structured summary including, as applicable: background; objectives; data sources; study eligibility criteria, participants, and interventions; study appraisal and synthesis methods; results; limitations; conclusions and implications of key findings; systematic review registration number.	
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of what is already known.	
Objectives	4	Provide an explicit statement of questions being addressed with reference to participants, interventions, comparisons, outcomes, and study design (PICOS).	
METHODS			
Protocol and registration	5	Indicate if a review protocol exists, if and where it can be accessed (e.g., Web address), and, if available, provide registration information including registration number.	
Eligibility criteria	6	Specify study characteristics (e.g., PICOS, length of follow-up) and report characteristics (e.g., years considered, language, publication status) used as criteria for eligibility, giving rationale.	
Information sources	7	Describe all information sources (e.g., databases with dates of coverage, contact with study authors to identify additional studies) in the search and date last searched.	
Search	8	Present full electronic search strategy for at least one database, including any limits used, such that it could be repeated.	
Study selection	9	State the process for selecting studies (i.e., screening, eligibility, included in systematic review, and, if applicable, included in the meta-analysis).	
Data collection process	10	Describe method of data extraction from reports (e.g., piloted forms, independently, in duplicate) and any processes for obtaining and confirming data from investigators.	
Data items	11	List and define all variables for which data were sought (e.g., PICOS, funding sources) and any assumptions and simplifications made.	
Risk of bias in individual studies	12	Describe methods used for assessing risk of bias of individual studies (including specification of whether this was done at the study or outcome level), and how this information is to be used in any data synthesis.	

Summary measures	13	State the principal summary measures (e.g., risk ratio, difference in means).	
Synthesis of results	14	Describe the methods of handling data and combining results of studies, if done, including measures of consistency (e.g., I^2) for each meta-analysis.	
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	
FUNDING			
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.	

ADDENDUM 2: SPECIFICATIONS OF THE EPPI-REVIEWER 4 SOFTWARE

EPPI-Reviewer 4: software for research synthesis

EPPI-Reviewer 4 is the EPPI-Centre's comprehensive online software tool for research synthesis. It is a web-based software program for managing and analysing data in literature review and has been developed for all types of systematic review such as meta-analysis, framework synthesis and thematic synthesis.

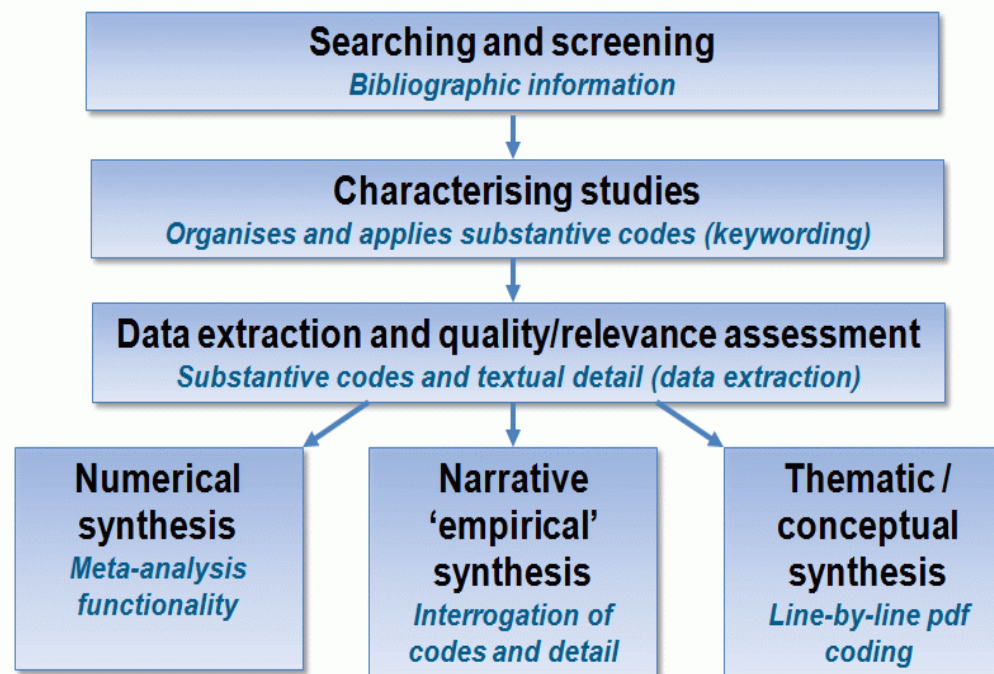
Systematic review

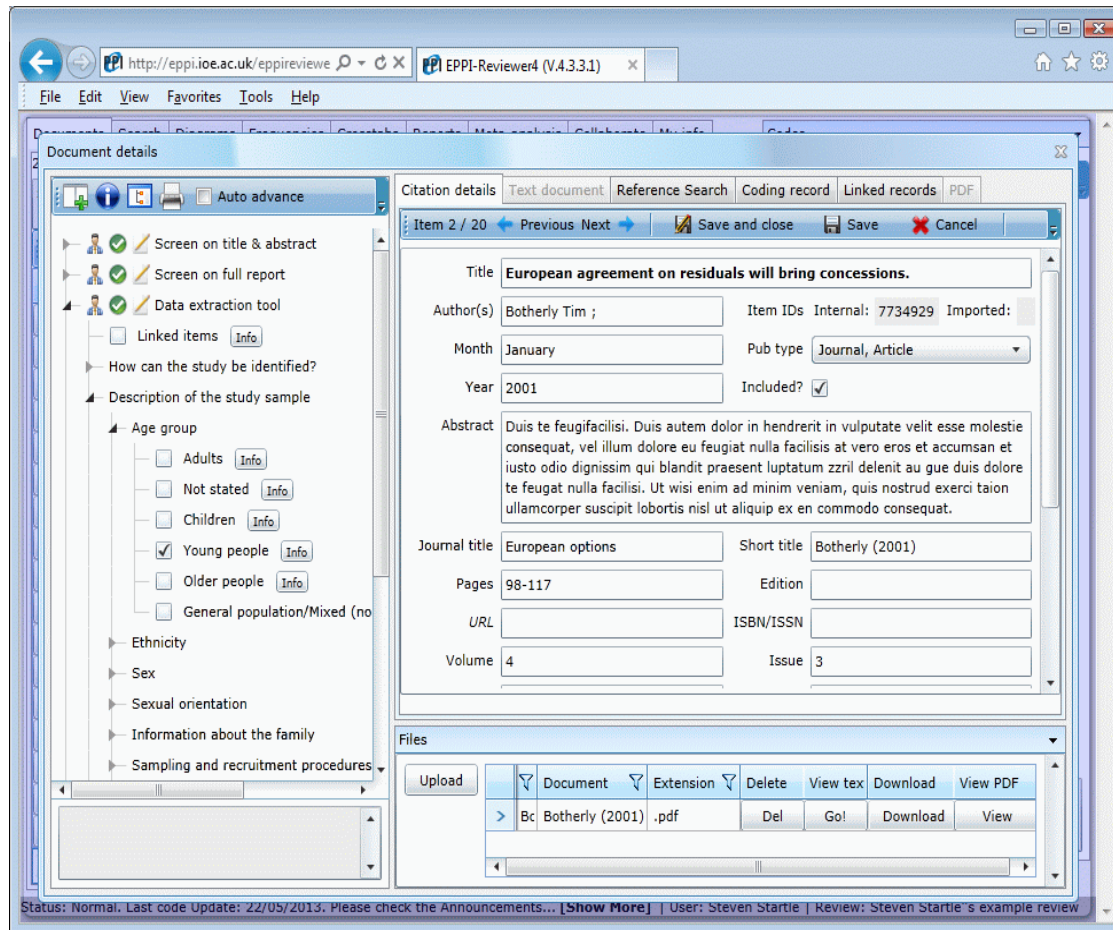
EPPI-Reviewer 4 has the functionality to help manage your systematic review through all stages of the process from bibliographic management, screening, coding and right through to synthesis.

It manages references, stores PDF files, facilitates qualitative and quantitative analyses and allows easy export of review data to enable use with other software programmes.

The software allows multiple concurrent users to access the system and being web-based allows members of a review group to be located in different geographic locations.

EPPI-Reviewer 4 supports many different analytic functions for synthesis including meta-analysis, empirical synthesis and qualitative thematic synthesis. It allows you to present your data in summary diagrams and customisable reports.



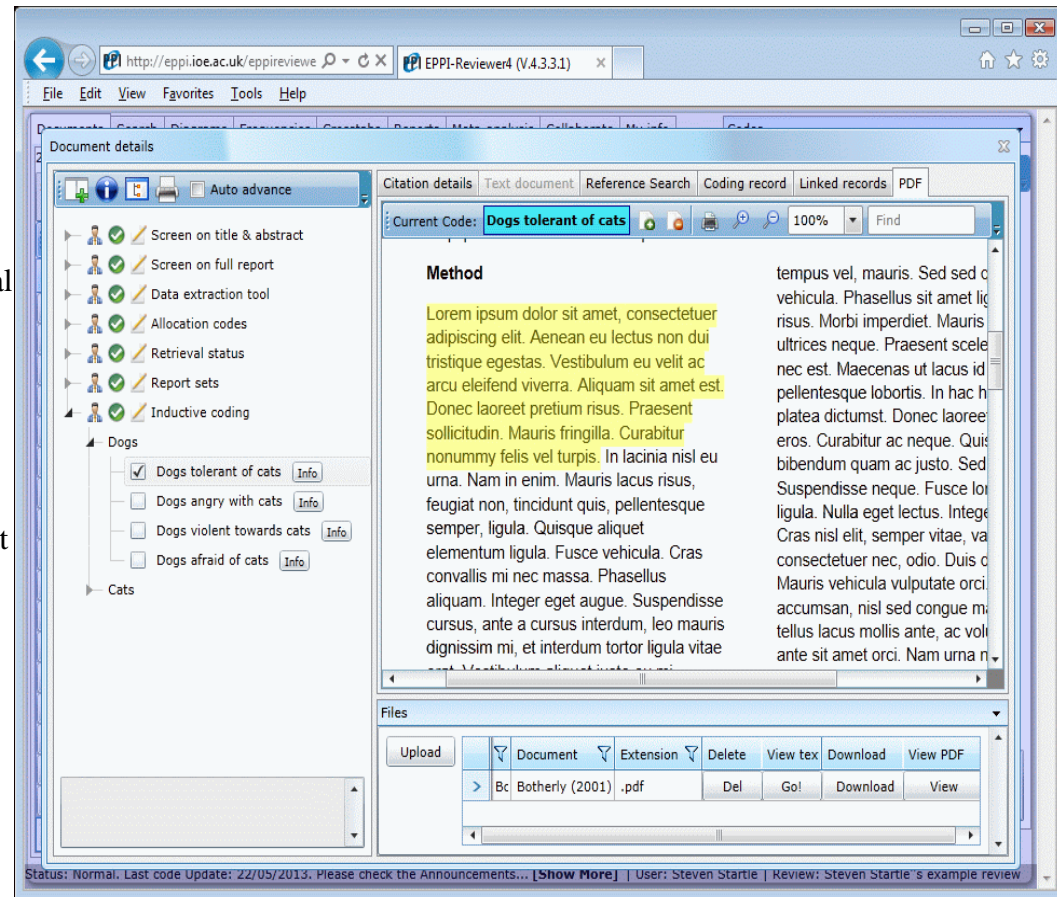


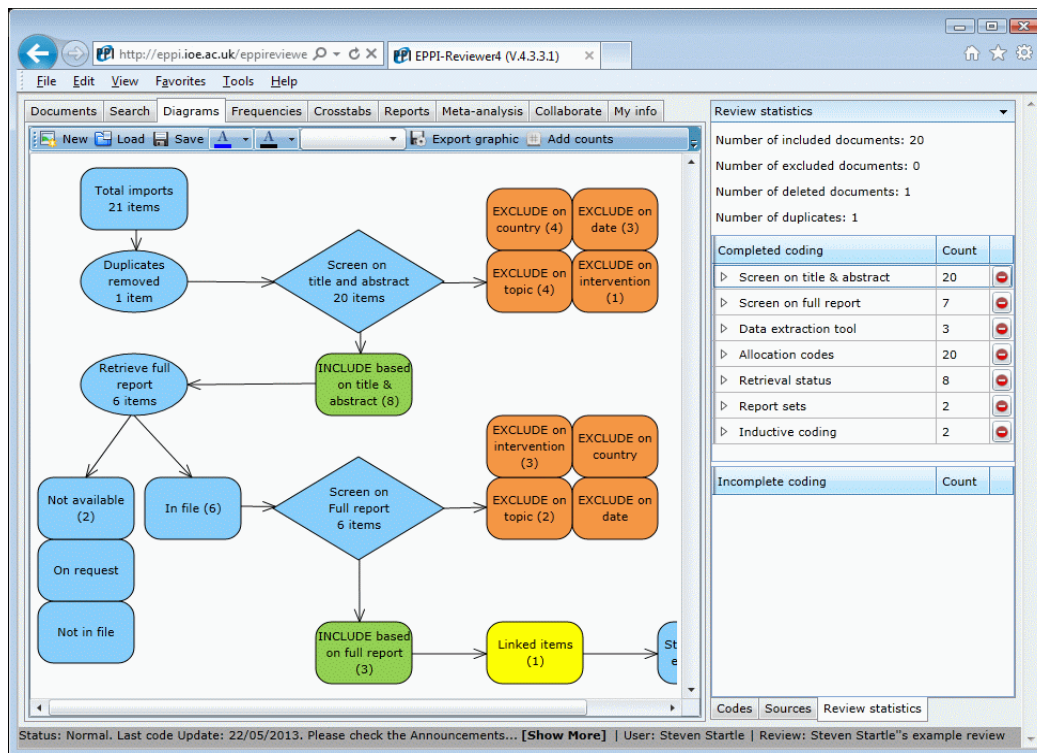
Study classification and data extraction

- Flexible coding schemas for classifying studies:
 - Inclusion / exclusion / eligibility criteria;
 - Codes for descriptive 'mapping' of research activity.
 - Codes to capture detailed information about a study.
- Concurrent multi-user classification: multiple users can classify studies independently and then compare their results; EPPI-Reviewer 4 works throughout this process, producing summary discrepancy reports and an interface to facilitate the process of agreeing final decisions.
- Bulk application / removal of codes to selected studies
- Calculation of common measures of effect (odds ratios, risk ratios, risk differences, standardized mean differences, mean differences) from a variety of statistics (2 x 2 tables, means, standard deviations, confidence intervals, p, t and r values).
- Text mining: automatic term recognition and document clustering.

Synthesis

- Running meta-analyses (fixed and random effects models); calculating I-squared and supporting subgroup analyses using analog to the anova
 - A powerful search engine enabling users to search by categories and text and combine searches using Boolean terms
 - Producing reports of categorical, numeric and textual data in a wide variety of formats from frequency reports, crosstabs and full-text reports, to tabular summary reports and summary statistics of numeric data
 - Text mining functionality. Automatic document clustering, using text mining, is one way of describing the range of studies you have identified at the click of a button. Text mining can assist with searching by identifying significant terms in the documents you have already included.
 - Inductive coding functionality. This allows line by line coding of textual data and organising and structuring these codes graphically into 'conceptual relationship diagrams to display analytic and descriptive themes found through inductive coding.
- Fulltext reference searching using the uploaded pdfs.
 - Diagrams to summarise e.g. qualitative syntheses and theories of change for interventions.





Review Management

- The ability to create an unlimited number of non-shareable reviews.
- Allocation of classification tasks (e.g. screening / data extraction) to individual users.
- Work progress reporting.
- Individual reviewer permissions (forthcoming)
- Review flow charts which update automatically (e.g. with counts of how many studies have been included / excluded according to which criterion in order to generate PRISMA flow-diagrams).
- Easy export of review data to enable use with other software programmes and to enable long term independent storage of data.

Under development

We have been developing ways of using emerging text mining technologies in systematic reviews. Currently used during the searching and screening stages of a review, you can read a paper which outlines their potential published in *Research Synthesis Methods**. We have also written up our early findings in the [NCRM Newsletter](#) and in a poster presented at the [2011 Cochrane Colloquium](#). Methods to use these technologies are still in their infancy and require significant further evaluation. While automatic term recognition and document clustering are available for all users, document classification often requires significant server processing time and support; therefore this technology is not yet generally available in EPPI-Reviewer. However, if you would like to use a classifier in your review, please contact us to discuss your particular requirements.

*[Thomas J, McNaught J, Ananiadou S \(2011\) Applications of text mining within systematic reviews. Research Synthesis Methods 2: 1-14.](#)

ADDENDUM 4: CASP TOOL FOR QUALITATIVE STUDIES

Screening Questions

1. Was there a clear statement of the aims of the research?

Yes Can't tell No

HINT: Consider

- What was the goal of the research?
- Why it was thought important?
- Its relevance

2. Is a qualitative methodology appropriate?

Yes Can't tell No

HINT: Consider

- If the research seeks to interpret or illuminate the actions and/or subjective experiences of research participants
- Is qualitative research the right methodology for addressing the research goal?

Is it worth continuing?



Detailed questions

3. Was the research design appropriate to address the aims of the research?

Yes

Can't tell

No

HINT: Consider

- If the researcher has justified the research design (e.g. have they discussed how they decided which method to use)?

4. Was the recruitment strategy appropriate to the aims of the research?

Yes

Can't tell

No

HINT: Consider

- If the researcher has explained how the participants were selected
- If they explained why the participants they selected were the most appropriate to provide access to the type of knowledge sought by the study
- If there are any discussions around recruitment (e.g. why some people chose not to take part)

5. Was the data collected in a way that addressed the research issue?

Yes

Can't tell

No

HINT: Consider

- If the setting for data collection was justified
 - If it is clear how data were collected (e.g. focus group, semi-structured interview etc.)
 - If the researcher has justified the methods chosen
 - If the researcher has made the methods explicit (e.g. for interview method, is there an indication of how interviews were conducted, or did they use a topic guide)?
 - If methods were modified during the study. If so, has the researcher explained how and why?
 - If the form of data is clear (e.g. tape recordings, video material, notes etc)
 - If the researcher has discussed saturation of data
-

6. Has the relationship between researcher and participants been adequately considered?

Yes

Can't tell

No

HINT: Consider

- If the researcher critically examined their own role, potential bias and influence during
 - (a) Formulation of the research questions
 - (b) Data collection, including sample recruitment and choice of location
- How the researcher responded to events during the study and whether they considered the implications of any changes in the research design

7. Have ethical issues been taken into consideration?

Yes

Can't tell

No

HINT: Consider

- If there are sufficient details of how the research was explained to participants for the reader to assess whether ethical standards were maintained
- If the researcher has discussed issues raised by the study (e.g. issues around informed consent or confidentiality or how they have handled the effects of the study on the participants during and after the study)
- If approval has been sought from the ethics committee

8. Was the data analysis sufficiently rigorous?

Yes

Can't tell

No

HINT: Consider

- If there is an in-depth description of the analysis process
- If thematic analysis is used. If so, is it clear how the categories/themes were derived from the data?
- Whether the researcher explains how the data presented were selected from the original sample to demonstrate the analysis process
- If sufficient data are presented to support the findings
- To what extent contradictory data are taken into account
- Whether the researcher critically examined their own role, potential bias and influence during analysis and selection of data for presentation

9. Is there a clear statement of findings?

Yes Can't tell No

HINT: Consider

- If the findings are explicit
 - If there is adequate discussion of the evidence both for and against the researchers arguments
 - If the researcher has discussed the credibility of their findings (e.g. triangulation, respondent validation, more than one analyst)
 - If the findings are discussed in relation to the original research question
-

10. How valuable is the research?

HINT: Consider

- If the researcher discusses the contribution the study makes to existing knowledge or understanding e.g. do they consider the findings in relation to current practice or policy?, or relevant research-based literature?
- If they identify new areas where research is necessary
- If the researchers have discussed whether or how the findings can be transferred to other populations or considered other ways the research may be used