

The application of the Theory of Planned Behaviour to prevent medication errors: a scoping review

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Abstract. *Background and aim of the work:* A safer drug therapy is a relevant aspect of nursing care and an essential component of the clinical governance function. Nurses are key players in the identification and prevention of medication errors that could occur in the drug management process. In the literature there is a particular interest to environmental and organizational factors, while, as we know, the subjective components are little considered. In psychology, the theory that prefers individual factor, at the expense of the environmental one, is Theory of Planned Behavior (TPB), although it has been little applied in the health field. The aim is to search the existing literature on the medication errors and the TPB to predict the intentions that foreshadow risk behaviours of nursing interns. *Methods:* This scoping review is grounded by Arksey and O'Malley's framework. *Results:* Attitude is the most determining predictor of intention. For many students reporting an error would lead to a loss of trust in the nursing profession and this could prevent the report. Nevertheless, some of them affirmed to be positively judged when they did it. It was then observed that a better education on safety raised the level of self-confidence and the sense of responsibility of the students, making them more inclined to the drug therapy management. *Conclusions:* The Theory of planned behaviour is essential to forerun the behavioural intention of students on the pharmacological safety and the collaborative practice through predictive factors, as attitude, subjective norms and perceived behavioural control. (www.actabiomedica.it)

Key words: medication errors, medicine error, medicament error, drug error, near miss, theory of planned behaviour

Introduction

As highlighted in the available literature, there is a certain relation between medication errors and potential life risk (1). According to the Joint Commission International (2) the occurrence of damages caused by medication errors is higher than any other kind of error. Medication errors are more frequent in hospital settings, especially in ICUs and Emergency Departments (3), and may deeply affect both patients' health and healthcare expenditure, as they often imply the

hospitalization of the patient or a longer hospital stay due to the deterioration in his clinical conditions.

Nurses play a key role in the therapy administration phase and they are accountant for the error prevention (4-6). The error prevention activity accounts for 40% of the clinical and nursing tasks (7,8). Nurses are key players in the identification and prevention of errors that could occur in the drug management process.

The drug therapy management represents a crucial moment in the nursing practice. The therapy man-

agement goes beyond the mere drug administration to patients: it is indeed, a longer process that requires high-level competences, solid theoretical knowledge and practical skills, and it is more and more complex and more often autonomously managed by the nursing staff (9). Thus, the occurrence of medication errors in one of the drug management phases is far than rare.

Errors may occur in every phase of the drug management, nevertheless, the available literature shows that there is a higher incidence of errors in the administration phase (10–12).

The main causes of these occurrences can be attributed to a scarce organization (i.e. inadequate communication, lack of standardized procedures or inaccurate draft of the documentation) or personal deficit (i.e. poor knowledge, attitude and behaviours) (13–15). But if we consider the University Hospitals, the phenomenon of drug errors occurrence must be analysed taking into consideration the presence of nursing students. Students become co-leading figures in the drug therapy management during their internship activities and according to their level of study. It is plausible to think that the possibility of making a mistake or a near miss increases in these contexts.

It is necessary to specify the intentions of the workers and the purpose of their intervention to understand if a particular occurrence should be considered an error or not.

The systematic review of the errors is indispensable to identify the causes and the circumstances that could lead to an error. The analysis of the error modalities can highlight the reasons why a person does not adopt an ideal behaviour in a specific context. This approach lets it possible to recognize the motivations that ground the wrong choices, which are the subject matter of this study: the awareness of the factors that can lead to the occurrence of an unwanted event will make the event itself predictable and, consequently, avoidable.

In psychology, the Theory of Planned Behaviour (TPB) by Ajzen (16) is the theory that prefers the individual factor to the environmental one.

The TPB results from the modification of a previous theory named “Theory of Reasoned Action” (17). This model aims at explaining the adoption of particular behaviours by the individuals, and it is based on three predictive factors:

1. Intention to behaviour: reason, development of conscious plans, decisions and self-instructions implemented to adopt a specific behaviour (18). The intention to behaviour is determined by the attitude toward behaviour and the subjective norms.
2. Attitude toward behaviour: attitude to perform or not a behaviour on the basis of the personal judgment regarding the behaviour itself (18). Attitude is a function of the behavioural beliefs, which represent the perceived consequences or the characteristics associated to the behaviour taken into consideration. In line with this conceptualization, consequences are made of the combination of the perception of the probability that the adoption of a behaviour could lead to a specific result and its evaluation.
3. Subjective norms: influence of other people’s opinions on the behaviour of an individual (18). It refers to the beliefs of other people or groups of people whose attitudes toward a behaviour are important to the individual. This variable is highly representative of the social influence, which individuals perceive with regard to the eventual adoption of a behaviour. Nevertheless, at practical level, the Theory of Reason Action developed only a limited success in the prediction of intentions (19). The limitation of the Theory of Reasoned Action is that it explains only voluntary behaviours, which require capability, sources and opportunities. If these are not easily accessible, the explanation of the behaviour cannot fall under the domain of application of the Theory of Reason Action, as it would predict it in an inadequate and incomplete way (20).

For this reason, the Theory of Reasoned Action was developed further to include the perceived behavioural control (16) and apply the Theory to behaviours, which differ from the voluntary ones. Some explicit considerations on the perceived control on the adoption of a behaviour were elaborated. Due to the addition of the perceived behavioural control as intention-predictive variable, the model was renamed Theory of Planned Behaviour (17).

The TPB has been largely applied to the Social Psychology and the Health Psychology fields to ana-

lyse the factors that determine the adoption of different risk behaviours with prevention and health promotion purposes (21). However, this theory could be applied to the health field.

The purpose of this paper is to search the available literature on the prevention of the medication errors and evaluate the application of the TPB to predict the intentions that forerun risk behaviours of nursing students and hypothesize its use with a preventive purpose.

Materials and Methods

The method employed to carry out this scoping review is grounded on the framework developed by Arksey and O'Malley (22), which consists of 5 primary phases: 1. Definition of the research question, 2. Identification of the pertinent studies; 3. Selection of the studies, 4. Data classification, 5. Comparison, summary and presentation of the results. The sixth optional phase of consultation was not performed (see Supplementary File 1).

Definition of the research question

“What is available in literature on the TPB and its application in the prevention of medication errors of nursing students?”

Identification of the pertinent studies

To answer the research question we took into consideration two fundamental concepts: *medication error* and the *theory of planned behaviour*.

We identified some key words and MeSH terms for each concept, then they were combined through the Boolean operator “OR” and “AND”. The research strategy employed is explained in the Appendix 1. In order to investigate the extension, the range and the kind of the available literature (22-24), the following online databases were searched: CINAHL, PubMed, e Cochrane Library, Scopus. We considered the publications issued in the last decade (2008-2018) in English and/or Italian.

Selection of the studies

The results of the search were imported in the software Zotero® and duplicates were eliminated. The selection of the pertinent studies was carried out based on some criteria, which were defined after a preliminary review of the results of the research.

The studies selected focused on the application of the TPB in the nursing field or in a similar field, with a particular focus on the interns. The evaluation of the quality of the studies was not an eligibility criterion, as it is not contemplated in scoping reviews (22-24). An initial reading of the title and abstracts, if present, allowed the exclusion of non-pertinent studies. Then, we analysed the full texts of the studies that proved to be suitable, or whose nature was in doubt.

Data classification

The reading of the full texts permitted to classify and organize the data in an extraction table (Appendix 2) using the Excel® software. The registered information was: author/s, year of publication, title, purpose of the study, method and results.

Comparison, summary and presentation of the results

Lastly, the classification of the data allowed the elaboration of a report of the facts that emerged from our scoping review. The data elaborated in the model were then analysed on the basis of the research question, using a qualitative analysis of the content.

Results

Three studies out of the 33 references extracted were considered pertinent (Figure 1).

In all the 3 pertinent studies (25-27) it was used the conceptual-theoretical framework of the Theory of Planned Behaviour, even if it was used for different purposes and kind of studies.

The study by Lapkin et al. (25) aimed at investigating the usefulness of a questionnaire based on the TPB to forerun the behavioural intention of students on the pharmacological safety and the collaborative

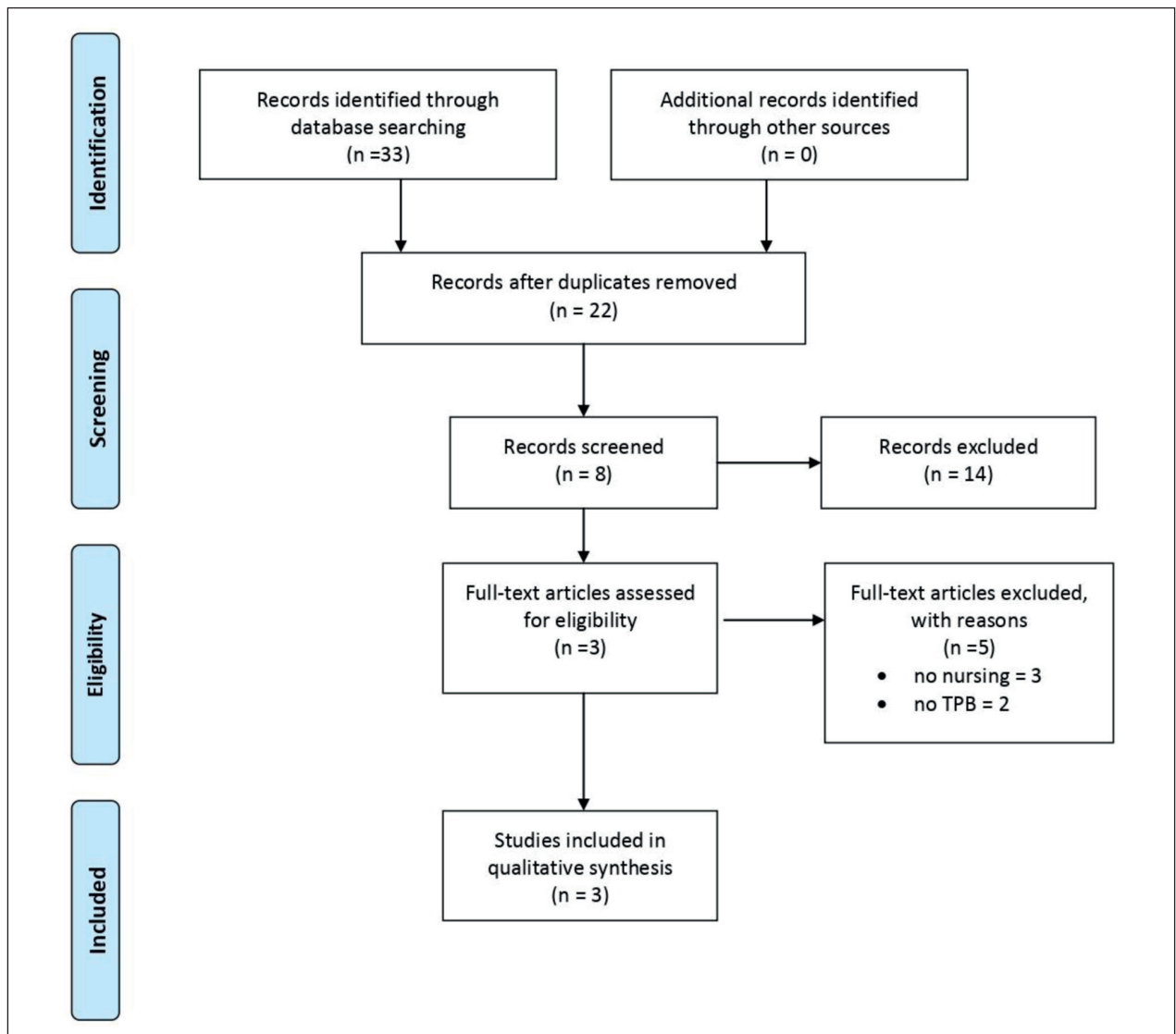


Figure 1. Flowchart

practice through predictive factors, as attitude, subjective norms and perceived behavioural control.

Omura et al. (27) analysed the impact of a multimedia learning resource on the action intention through a questionnaire based on the TPB framework, to foster the pharmacological safety among nurses and nursing students.

The study carried out by Natan et al. (26) aimed at analysing the factors that determine the intention of nursing students to report medication errors, identifying the Theory as a tool to predict the intention to report the errors committed.

Limits of the study

The main limitation of this study is the availability of few studies that support the use of the TPB in the specific field of therapy errors made by nursing students. Author(s) report on results of a scoping review for the purpose of searching the available literature on the prevention of medication errors and evaluate the application of the TPB to predict the intentions that forerun risk behaviours of nursing students, and to then hypothesize its use with a preventive purpose. For this aim, only three sources out of a possible 33

were included for this review. Although there are few sources, only those relevant to the research question have been selected. Moreover, the use of this theory in the health field has been used mainly to investigate the variables that lead to the genesis of medication errors principally in workers (nurses and doctors), to our knowledge there are few studies that interest nursing students. An ad hoc in-depth study is therefore necessary to evaluate the applications of this theory to prevent medication errors at clinical level.

Discussion

This work seeks to assess the effectiveness of the TPB in predicting the intention of adopting or changing some behaviours in the health field, mainly focusing on the pharmacological security. To meet this goal, we carried out a scoping review, through which we investigated the available scientific literature on medication errors and the application of the TPB in this field.

The analysis of the literature highlighted a little availability of specific studies on the application of this theory in the pharmacological error sector. For this reason, it was necessary to take into consideration some studies in which the TPB was applied in fields similar to the one of our interest.

Thanks to the comparison of the employment of the TPB in the different studies, it was then possible to identify some grouping areas of expertise of the selected articles (which correspond to the three constructs of the psychological theory considered) to make the presentation of the main outcomes uniform and structured.

Attitude

Attitude is considered the most important intention predictor of the all elements of the TPB (25). One of the studies included in this scoping review revealed that 78% of nursing students show a strong intention to report pharmacological errors, as they are aware that reporting an error is crucial to avoid the reiteration of that mistake (26).

The intention of reporting an error is associated to the behavioural beliefs and the perceptions of the

students of the importance of reporting an error (26). The outcome of the study by Natan et al. (26) does not perfectly match with the study by Omura et al. (27), who administered a questionnaire to evaluate the effects of a multimedia path on the intention of students of reporting a pharmacological error. Actually, in this study the test group registered lower scores relating to the behavioural intentions than the control group (27). The author advanced some motivations to explain this outcome, as follows: the scores of the test group are low because Japanese students have limited experience in administering drugs, as they mainly have an observational knowledge, and this may prevent them from understanding the nursing responsibilities that are at the base of the pharmacological errors (27).

Subjective norms

All the studies included in this scoping review demonstrated the correlation between the subjective norms and the intention of the students to report a pharmacological error, even if some studies focus on the positive effects of this relation, while other focus on the negative ones. This dual point of view of the correlation between subjective norms and error reporting depends on the fact that people tend to perform willingly only those behaviours that the society sees as positive and acceptable (25,26) focused on the negative effects, paying particular attention to the social pressure that, according to the students, tutors and professors may make on those who admitted to make a pharmacological error. Moreover, some students believe that reporting a therapy error may cause a loss of trust of the society in the nursing profession. The concern for the damage to the reputation of the nursing profession could prevent students from reporting the errors they made (26). Even from this point of view, Natan et al. (26) achieved results that differ from Omura's outcomes: actually, Omura highlighted that, based on the scores of the test group, students believe to be positively judged by professors and nurses when reporting a pharmacological error (27). The results of Lapkin's study (25) led him to an intermediate position between Omura et al. (27) and Natan et al. (26). According to his study, students seem to attach little importance to other people's judgment on the pharmacological error

and the professional who made it. This result contrasts with the results achieved by the majority of the studies carried out on this field, as the opinion of the others deeply affects the adoption of a behaviour (25).

Perceived behavioural control

All the studies included in this scoping review highlighted an important correlation between the perceived behavioural control and the intention to report a pharmacological error (consequently to its actual reporting too). Omura et al. (27) observed a significant increase of the perceived behavioural control scores at the end of a multimedia learning path (27). This matches with the results achieved by Lapkin et al. (25), according to whom learning opportunities aimed at enhancing the communication, the team working and the trust in the colleagues make students more competent in the drug therapy and more responsible in case of error reporting (25).

Natan drew a similar inference: he observed that raising students' awareness on the drug administration safety increases their level of self-confidence and their sense of responsibility, making them more inclined to report therapy errors (26). Probably, self-confidence and intention to report a pharmacological error are two variables, which are correlated in a directly proportional way, even if it is necessary to carry out specific studies to confirm this hypothesis. In light of what it was shown up, the perceived behavioural control is a critical factor in the management of pharmacological errors (25). Taking educational actions focused on the cooperation with the group may be a valid intervention in the pharmacological safety area.

Implication for education, nursing practice and health policy

The analysis of the available literature highlighted the usefulness of the TPB in explicating the adoption of some behaviours on the basis of its three main constructs and its successful implementation in some areas of expertise similar to the pharmacological safety field (25-27). Actually, the predictive power and the perceived behavioural control, in relation to the safe

management of the therapy, support the application of the theoretical model of the TPB.

The predictive power of the attitude, in particular, is crucial. The analysis of studies carried out in hospital environments and focused on nursing workers highlight this concept. The prevention of medication errors is analysed in relation to the attitude and it highlights that awareness is a decisive factor to reduce the risk of errors (3, 28, 29). The results of the scoping review indicate important inferences to the development and implementation of strategies aimed at improving the pharmacological safety and to the application of the TPB and tools based on it, in order to evaluate the effectiveness of educational interventions. Indeed, it was clear that educational opportunities aimed at promoting communication, team working and trust in the colleagues, help to enhance students' competency in the pharmacological therapy and their sense of responsibility in case of adverse events (27). Given the considerable influence of the subjective norms on the behaviours, it is necessary to raise health and care safety awareness, fostering productive and non-punitive discussions, whose object is to analyse errors, instead of start a "hunt for the guilty party".

Experiences play a key role: it is thanks to them that nurses gained awareness of the importance of complying with the correct behaviours during the whole drug management process, to prevent medication errors (9,30).

Conclusion

In the light of this analysis, we believe it would be interesting to examine further this issue, carrying out new studies that focus on the possible effective application of this conceptual model to prevent medication errors made by nursing students and professionals.

The Theory of planned behaviour (TPB) is essential to fore-run the behavioural intention of students on the pharmacological safety and the collaborative practice through predictive factors, as attitude, subjective norms and perceived behavioural control. Authors emphasize the importance to an in-depth research to identify appropriate measures to minimize MEs and improve patient safety.

Although the global interest on this topic is still insufficient; modern medicine must be able to respond to the complex health needs of the person however it must do so through a consistent use of resources without jeopardize patient safety (15).

Acknowledgements and author contributions:

Study design: SD, EDS, NG, RC, MDM

Data collection: SD, EDS, VF, EC, FDM, RC, NG, MDM

Data analysis: SD, EDS, NG, MDM

Study supervision: SD, MDM

Manuscript writing: SD, EDS, VF, EC, FDM, RC, NG, MDM

Critical revisions for important intellectual content: SD, EDS, VF, EC, FDM, RC, NG, MDM

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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Received: 13 February 2020

Accepted: 20 April 2020

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Appendix 1

ID	QUERY
#8	Search ((((((medication error[MeSH Terms]) OR medicine error) OR medicament error) OR drug error) OR near miss)) AND theory of planned behaviour
#7	Search theory of planned behaviour
#6	Search ((((((medication error[MeSH Terms]) OR medicine error) OR medicament error) OR drug error) OR near miss
#5	Search near miss
#4	Search drug error
#3	Search medicament error
#2	Search medicine error
#1	Search medication error[MeSH Terms]

Appendix 2

Authors and years	Title	Aim	Method	Result
Natan M.B., Sharon I., Mahajna M., and Mahajna S., 2017.	Factors affecting nursing students' intention to report medication errors: an application of the theory of planned behaviour	Examine the factors associated with nursing student intentions to report pharmacological errors, using planned behavior theory (TPB).	Cross-sectional study	The results of the study reveal that 78% of students expressed a strong intention to report therapy errors. The behavioral beliefs of the students regarding the reporting of therapeutic errors were associated with their intention to report, in fact more than 70% of the students agreed that the identification of the causes of errors is the responsibility of the coordinating nurse. The behavioral intention, the subjective norms (social pressure) on the part of peers and clinical preceptors, the knowledge of the students about the reporting of therapy error and their perceived behavioral control resulted in correlation with their intention to report.
Omura M., Levett-Jones T., Stone T.E., Maguire J., and Lapkin S., 2015.	Measuring the impact of an interprofessional multimedia learning resource on Japanese nurses and nursing students using the Theory of Planned Behavior Medication Safety Questionnaire	Assess the impact of an interprofessional learning resource on the intentions of nurses and nursing students, with the aim of promoting drug safety.	A quasi-experimental study using the TPB-MSQ questionnaire.	The results emerged from this study show that the variables that influence behavioral intention, ie attitude, perceived behavioral control and subjective norms were higher in nurses after seeing the video. The significantly higher average in the scores of perceived behavioral control and in the subjective norms in the experimental group compared to the control group show: in the first case the participants showed greater self-esteem and therefore awareness of having better skills and security in the implementation of specific behaviors relating to pharmacological safety; in the case of subjective rules, in the same way, the results indicate that the participants believed that they would be judged positively by colleagues for the promotion and safe management of drugs. On the contrary, in the nursing students who saw the multimedia learning resource (the experimental group) the behavioral intention scores were lower than those of the control group, whose motivation could be found in the little clinical experience of drug therapy and in using mainly a type of learning that exploits memorization rather than practical skill.

Authors and years	Title	Aim	Method	Result
Lapkin S., Levett-Jones T., and Gilligan C., 2015.	Using the Theory of Planned Behaviour to examine health professional students' behavioural intentions in relation to medication safety and collaborative practice	The main objective of the study is to evaluate the usefulness of a questionnaire based on the theory of planned behavior (TPB) to predict the behavioral intentions of students in the health professions in relation to drug safety and collaborative practice. Moreover in the study we want to determine the contribution of attitude, subjective norms and perceived behavioral control on the intentions of the students.	Cross-sectional survey based on TPB.	<p>The study reports that attitude, subjective norms and perceived behavioral control represents 46% of the variance in the students' intentions to practice in such a way as to improve the safety of drug therapy. Attitude is generally considered to be the strongest predictor of intention, perceived behavioral control, in the same way, is a critical factor that influences students' intention to exercise in a way that improves drug safety and collaborative practice.</p> <p>Efforts to improve drug safety and collaborative practice should</p> <p>therefore, once you have ensured that health students are provided with educational opportunities that promote teamwork, communication, competence and trust, the elements necessary for the safe management of drugs. The elements of the subjective rules have had a negative effect on the behavioral intention, this result</p> <p>suggests that students seem to value the contribution and perceptions of others on drug safety.</p>