

**DEVELOPMENT OF AN EVIDENCE-BASED CHECKLIST FOR THE
DETECTION OF DRUG-RELATED PROBLEMS (DRPs) AMONG PATIENTS
WITH ALLERGY SYMPTOMS IN COMMUNITY PHARMACIES**

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ABBREVIATIONS

DRP	Drug related problem
pDRP	Potential drug related problem
GP	General Practitioner
MRP	Medication related problem
NSAID	Non steroidal anti-inflammatory drug
USM	University Sains Malaysia
ADR	Adverse Drug Reaction
OTC	Over the counter
PCNE	Pharmaceutical Care Network Europe
WHO	World Health Organisation
NPSA	National Patient Safety Agency
FDA	Food Drug Authority
USA	United States of America
ADE	Adverse Drug Event
DCA	Drug Control Authority
SWE-DRP	Sweden Drug Related Problem
SEM	Structural Equation Modeling
DUR	Drug Utilization Review
CKD	Chronic kidney disease
PAIR	Pharmacotherapy Assessment in Chronic Renal Disease

pMDI	Pressurized metered dose inhaler
COPD	Chronic obstructive pulmonary disease
TP	True positive
FP	False positive
TN	True negative
FN	False negative
PPV	Positive predictive value
NPV	Negative predictive value
MHRA	Medicines and Healthcare products Regulatory Agency
VAERS	Vaccine Adverse Event Reporting System
MAUDE	Manufacturer and User Facility Device Experience Database
MADRAC	Malaysian Adverse Drug Reactions Advisory Committee
ASHP	American society of Health System Pharmacists
NCC-MERP	National Coordinating Council for Medication Error Reporting and Prevention
PIE-system	Provider Inquiries Evaluation
EMA	European Medicines Agency

**PEMBANGUNAN SENARAI SEMAK DRP YANG BERASASKAN BUKTI
UNTUK MENGESAN MASALAH BERKAITAN DRUG (DRPS) DI
KALANGAN PESAKIT DENGAN SIMPTOM ALAHAN DI FARMASI
KOMUNITI**

ABSTRAK

Amalan farmasi komuniti telah banyak membuat penambahbaikan dalam kualiti dan keselamatan pesakit terutamanya dalam mengesan ‘masalah yang berkaitan dengan drug (DRP)’ yang berkenaan dengan penjagaan farmaseutikal. Objektif kajian ini adalah untuk membangunkan satu senarai semak yang dapat mengesan masalah berkaitan dengan drug di kalangan pesakit dengan alahandi farmasi komuniti. Kajian ini juga bertujuan untuk mengesan jenis (DRP) dan kelazimannya di Seremban dalam konteks gejala alahan. Kajian ini dibahagikan kepada fasa pembangunan senarai semak DRP yang melibatkan kajian literatur. Fasa pegesahan senarai semak DRP disahkan melaluivalidasi, sensitiviti dan spesifisiti dengan bantuan dua doktor pakar dan dua ahli farmasi. Senarai semak yang disahkan kemudiannya diuji di fasa terakhir yang dibahagikan kepada dua kumpulan iaitu Kumpulan 1 (dengan senarai semak) dan Kumpulan 2 (tanpa senarai semak). Dalam fasa pengesahan senarai semak, 378 pesakit telah ditemuramah. Hampir tiga belas peratus (12.96%) daripada pesakit telah dikenal

pasti mengalami DRP. DRP yang utama dikenalpasti adalah penyakit yang tidak dirawat dan pesakit yang memerlukan terapi tambahan. Purata penggunaan jenis ubat seorang pesakit menunjukkan mean 4.0 ± 2.7 . Validasi senarai semak DRP menunjukkan nilai sensitiviti sebanyak 77.37% dan nilai spesifisiti sebanyak 98.24%. Analisis univariansi dengan nilai ($p < 0.05$) berkaitan dengan ubat terutamanya steroid antihistamin dan antibiotic. Regresi logistik mengenalpasti pesakit mengalami alahan setelah mengambil makanan atau ubatan. Analisis multivariansi mengenalpasti polifarmasi, kealpaan, interaksi makanan/ubat/masalah kesihatan dan cara penstoran ubat adalah punca utama masalah DRP. Dalam fasa terakhir, seramai 104 pesakit (Kumpulan 1) dan seramai 92 pesakit (Kumpulan 2) telah ditemuramah. Kumpulan 1 berjaya mengesan lebih bilangan pesakit dengan DRP berbanding Kumpulan 2. Kajian ini berjaya membangunkan satu senarai semak yang boleh digunakan sebagai kaedah pengesanan DRP di kalangan pesakit yang menerima rawatan di farmasi komuniti di kawasan Seremban.

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ABSTRACT

Pharmacists in community practice is making many improvements in the quality and safety of patients especially in detecting drug related problems (DRP) related to pharmaceutical care. The objective of this study was to develop a checklist which would be able to detect drug related problems among patients with allergy symptoms who seek treatment in community pharmacies. This study also aimed to detect types of DRPs and its prevalence. The Checklist Development Phase involved review of literatures. The developed checklist was then tested in validation phase where it was used in a community setting to obtain data and to get it validated. Four expert panel agreement, predictive values, sensitivity and specificity tests were done to validate the checklist. This validated checklist was then field-tested in two groups (Group 1; with the checklist) and (Group 2; without checklist). During the validation phase, 378 patients were interviewed. About thirteen percent (12.96%) of them were identified as

having DRPs. Main DRPs identified were untreated indication and in need of additional therapy. Average types of medication usage per patient were mean 4.0 ± 2.7 . Validation of the checklist showed sensitivity of 77.37% and specificity of 98.24%. Univariate analysis with significant DRP value ($p < 0.05$) were detected from the usage of medication such as steroids, antihistamines and antibiotics. Logistic regression identified significant DRPs among patients who had allergy symptoms after ingestion of food or medications. Whereas multivariate analysis identified polypharmacy, forgetfulness, food/medicine/medical history and improper storage of medicine as main causes of DRPs. During the field test, 104 patients were interviewed in Group 1 whereas 92 patients were interviewed in Group 2. Group 1 successfully identified more patients with DRPs compared to Group 2. The study managed to develop a checklist which can be used as a detection method for DRPs among patients who sought treatment in community pharmacies in Seremban.

CHAPTER 1

1.0 INTRODUCTION

1.1 BRIEF OVERVIEW OF DRUG RELATED PROBLEMS

Pharmaceutical cares are processes of cooperation between a pharmacist, the patient and other healthcare professionals. This group diagnoses and designs, implements, and monitors a therapeutic plan with specific therapeutic outcomes for the patient. This care is provided for the good and direct benefit of the patient and the pharmacist is responsible to the patient for the quality of that care provided (Hepler and Strand 1990). These processes involve three major functions:

- a) Identifying potential and actual drug related problems.
- b) Resolving actual drug related problems.
- c) Preventing potential drug-related problems.

Prevention and reduction of drug-related problem morbidity and mortality are accepted as a social responsibility by the pharmacist profession (Billups, 2000).

1.2 DRUG-RELATED PROBLEM MORBIDITY AND MORTALITY

Drugs which are (prescription medication, over-the-counter medication and herbal medications) are widely used in the ambulatory population to lower down morbidity and mortality frequencies and to improve quality of life; however, they can also cause

significant and important problems that result in costs to the health care system. Drug related problems are associated with problems at different stages in the medication use process which involves the prescribing phase, dispensing phase and monitoring phase (Billups, 2000).

1.3 PREVENTABILITY OF DRUG-RELATED MORBIDITY AND MORTALITY

Drug related problem morbidity or mortality happens due to some unrealized or unexpected reaction and very patient-specific reason. Some of the drug related problem morbidities that result from medication mishaps are also not known and unpredictable (Ives, et al., 1984). For example, many prescribed regimen have standardized dosage ranges, and if a patient experiences a toxic reaction while receiving a high dose which is much higher than usual, the patient may be justified that the toxicity would have been avoided if monitored carefully.

Table 1.0 Findings of DRPs from literature review

RESEARCHER	FINDINGS
Hoe(2007)	USM Hospital found 70 admission cases; (63.6%) DRPs were the total reason of admission.
Shargel (2002)	Studies on DRP especially on compliance in asthma, diabetes, hypertensive and geriatric patients from 1995- 2001 showed compliance increased with the help/guidance from pharmacist in hospital settings.
Burnum(1990)	42 ADRs were identified in a group of 1000 patients. 23 of the ADRs were preventable and six avoidable reactions were the source from the pharmacy.
Trunet(1986)	Unnecessary admissions due to DRPs accounted for about 61% for the 1980 admissions of patients from severe care to intensive care.

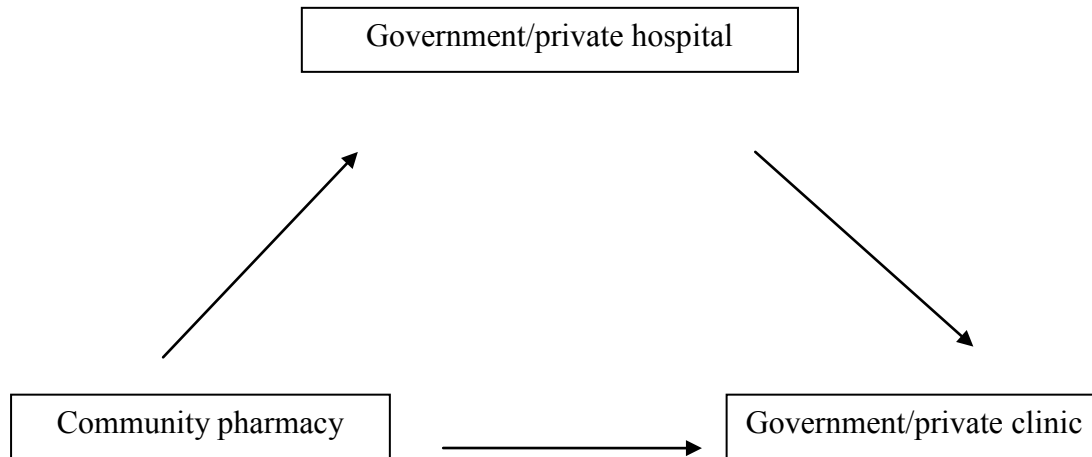
Ives, et al. (1984) stated that much of the DRPs are not due to the drug products themselves but in the manner of how they are prescribed, dispensed and used by the patients. The prevalence of drug related problems morbidities and their indications show that much of them are preventable, and preventing them may actually diminish total costs while improving excellence of care. McKenney and Wasserman (1988) support the statements above with their research which show that pharmaceutical

services can significantly decrease DRPs, the total expenditure of care and the length of hospitalization.

1.4 DRUG RELATED PROBLEM – LOCAL SCENARIO

Allergy symptoms are commonly treated among patients who visit community pharmacies in our country. These patients could be facing DRPs due to medication therapies given by various healthcare professionals. Very limited studies on drug related problems (DRP) s among patients with allergy symptoms have been done in community pharmacies in Malaysia setting. A full scope of studies of DRPs due to the three phases which are the prescribing phase, dispensing phase and patient phase in our community pharmacies do not exist in Malaysia (Elkalmi, 2011). A proper survey method has to be developed to get proper data of DRP occurrence in Malaysia.

1.5 CURRENT HEALTHCARE SYSTEM



(Figure 1.0 – Medical and medication information communication between community pharmacies and other health centers)

Malaysia's healthcare system consists of public and private health sectors. The government funds the public healthcare system which is supported mainly from taxes on earned income. The public healthcare system provides services to everyone through a network of tertiary care centers, general hospitals, district hospitals and health clinics (Elkalmi, 2011). The private health sector, are combination of private hospitals and general practice (GPs) clinics, community pharmacies and traditional healthcare practitioners (Ministry of Health, Malaysia, 2011). In the view of private sector, medication usage in the community setting such as prescription medicines dispensing follow a traditional 'dispensing doctors' system where their professional practice allows

general practitioners dispense medications (Sing, 2001). Until today there are no proper guidelines of communication and referrals' between government or private hospitals or clinics and community pharmacies. Community pharmacists are unable to detect DRP efficiently because they are not given a standard guide for DRP reporting (Sing, 2001).

From literature reviews, each country has their own definition and scenario about DRPs and has developed instruments to identify them in the community pharmacy setting such as PIE-system and PCNE V5.1 (Paulino, et al., 2007; Van Mil, et al., 2001).

So far a few studies have been done to categorize and identify these DRPs in community pharmacies setting in Malaysia (Chua, 2012; Neo, 2010; Elkalmi, 2011). All these studies concentrated on different DRP aspects such as ADR pharmacovigilences(Elkalmi, 2011) and information collaboration rates between GPs and community pharmacists among chronic illness patients (Chua, 2012).

A proper screening instrument and checklist as a guide for community pharmacist should be developed to help our community pharmacies. A checking system which consists of patients' medication history and basic patient assessment must be created to help community pharmacist to work together with other health centers to curb existing DRPs in Malaysia.

1.6 HYPOTHESIS

An adapted or created DRP classification system or checklist used among community pharmacies in Malaysia could be the stepping stone to detect drug related problems and its causes, for the benefit of a nationwide integrated health system. Thus, the hypothesis for this research is:

Ho: Development of a checklist may not be able to help the pharmacists to identify DRPs in the community pharmacy settings.

H₁: Development of a checklist may be able to help the pharmacists to identify DRPs in the community pharmacy settings.

1.7 OBJECTIVES

1.7.1 GENERAL OBJECTIVE

To develop an evidence-based DRP (drug related problems) checklist that can be used to review patients' clinical condition and medication treatment to recognize DRPs among patients who complained of allergy symptoms who visit a community pharmacy for treatment.

1.7.2 SPECIFIC OBJECTIVES

- a) To develop a checklist to detect DRP among patients who come for allergy symptoms treatment in a community pharmacy.

- b) To estimate prevalence of DRPs among patients with allergy symptoms who visit a community pharmacy for treatment.
- c) To categorize and to determine the types and causes of DRPs identified.
- d) To determine the types of patients with allergy symptoms who were at risks for DRPs.
- e) To validate the DRP checklist; specificity and sensitivity of the checklist
- f) To find association between DRPs and their problems and causes.

1.7.3 SIGNIFICANCE OF THE THESIS

A DRP checklist developed according to the local problems could help pharmacists to detect DRPs among patients who visit community pharmacies. The DRPs detected could be used as a tool to provide additional information for healthcare providers such as physicians to deliver good pharmaceutical care. In this research, allergy was selected as one of the criteria as it is one of the common complaint or symptoms among walk in patients in community pharmacies (Strannegard, 2001).

CHAPTER 2

2.0 LITERATURE REVIEW

This chapter aims to provide a conceptual and theoretical understanding for the study.

The theoretical framework to DRP detection for patient care were first introduced to community pharmacy practice by American scientists Hepler and Strand in 1990 under the concept of Pharmaceutical Care (Hepler and Strand 1990). This study is based on a framework done by Bob (2009) which was related to the development of a DRP checklist in a major disease, development of DRP checklist in community pharmacy setting (Williams, 2012) and the DRP detection methods among pharmaceutical care issues by Chua (2012). Thus, this study concentrates on the development of DRP checklist in a community pharmacy among selected patients with types of allergy symptoms. Few types of DRP classification systems and studies are also reviewed in this chapter (Table 2.2).

2.1 THE EVOLUTION OF DRUG RELATED PROBLEM DEFINITION

Drug-related problem was initially defined as “an undesirable patient incident that involves drug treatment and that actually or potentially interferes with a required patient result” (Strand, et al., 1990). The definition often used as a synonym with an expression “drug-therapy problem” which is distinct as “any unwelcomed event faced by the

patient that involves or is alleged to include drug therapy that actually or potentially interferes with required health result (Cipolle, et al., 1998; 2004). At present, the terms usually defined as “an occasion or condition involving drug therapy that actually or potentially interferes with the desired health outcomes” (Pharmaceutical Care Network Europe, 2010). The definitions of drug related problems varies and depend on the general cultural factors especially the function of disease and choices of treatment for that disease in that society. It also depends on the language and the country’s underlying health system (Van Mil, et al., 2001). DRPs have developed to become a unique area of clinical pharmacy research.

2.2 PREVALENCE OF DRP FROM OTHER STUDIES

Roughead (2004) who reviewed 1000 clinical case notes acknowledged 99% of patients had slightest one medication-related problem. In their study, high number of patients were found to need additional monitoring, additional medication, were using the wrong or unsuitable medication and were using insufficient medication. Cardiovascular, nervous system, alimentary and respiratory drugs were accounted for 69% of the drug-related problems (Roughead, 2004). Although the setting of both studies were different (one in community pharmacy and one in hospital), the authors agreed that prevalence of DRPs were high among patients. Some potential drug related

problems if over-looked can manifest and cause actual drug related problems (Roughead,2004)

According to Lewinski, et al. (2010) who surveyed patients in 69 community pharmacies in Berlin with a checklist for estimating quality assurance, among 3040 surveyed patients, 638 (21.0%) patients who visited the pharmacies were detected having DRPs. His study also identified significant risk factors such as self-medication, therapeutic errors and information problems. Drug classes that associated with the DRPs detected were NSAIDs, antibiotics, nasal preparations and cough medications.

2.3 RISK FACTORS OF DRPs

Studies by Sarah (2000) showed inconsistent associations of DRPs were reported for race but more on type of lifestyle of that race personally. She did mention that the rationales for the rising prevalence of allergic diseases over the most recent decades in the world are indefinite. It was thought that the causes were originated among factors from the environment.

There were differences in the occurrence of allergic diseases between rich and poor people, among urban and rural areas, and between Eastern and Western countries. But, according to Rajesh (2011) prevalence of allergy between races is significant. So there are two schools of thought for this issue.

Significant inter-individual variability was evident in allergy incidence. Studies by Shusterman (2003) proved that advancing age predicted a greater response to allergens ($p < 0.01$). No gender effect was observed. There was correlation of DRP occurrences among certain diseases such as asthma and age.

Published journal by McMillan, et al. (1986) stated that DRPs especially ADR are age linked especially among elderly individuals or those with poly-pharmacy. The knowledge of the comparative importance of various risk indicators would guide to better risk management strategy among different patient subgroups. This finding is in accordance to those reported from Denmark, (Hallas, et al., 1992) and the Netherlands (Veehof, et al., 1999). There were comparative risks in developing ADRs for female patients. However, there were several differences in patient characteristics between the surveys.

Lewinski, et al. (2010) also did mention that age, gender and the quantity of dispensed medication had little control on occurrence of DRPs. The much larger sample sizes in the earlier studies allowed them to be more alert in detecting the association between female gender and the possibility of increasing ADRs.

During his latest studies, Beers (1991) compared few studies about risk factors of DRP and summarized that there are contradiction between age and DRP but the actual

reason of DRP occurrence is poly-pharmacy. The incidence of DRP increases exponentially once an aged person takes more than five types of medications (Slater, 1993). Other published studies indicate that other contributing factors to DRP such as medical conditions, type of medications, social situation, ability to pay for the treatment and medication and understanding the treatment regimen. There are recorded statistics showing that DRPs are also caused by these factors (Kaufman, 2002).

Ghouri (2008) recorded that prevalence of allergic rhinitis with DRP have increased substantially in recent years. A similar increase in prescriptions for oral and topical antihistamines and drugs used in nasal allergy in patients with allergic rhinitis were also observed. Whereas Thomson (2001) proved that prevalence of topical corticosteroid are quite high and differ among countries. It depends on the prescribing and dispensing practice in the particular country. Contact dermatitis has been recorded with the non-fluorinated steroid (Thomson, 2001). Occurrences of DRPs would increase if the practice goes on without realization. Tibblea (1999) also recorded those antipyretics especially NSAIDs showed high prevalence which depended much on the prescribing and dispensing practice of the area. He also mentioned that the DRPs caused such as enteropathy was independent of the particular type or dose of NSAID being taken.

Thomas (1978) mentioned that oral and topical antibiotics caused bacterial resistance for frequent usage and telling that systematic comparisons of resistance prevalence in dissimilar parts of the world might assist to define optimal antibiotic usage practices.

Lewinski (2010) study among patients who go to community pharmacies showed that of the 3040 surveyed patients, 638 (21.0%) were affected by DRPs. Risk factors identified were self-medication and new medication, especially new prescriptions. The two major groups of DRPs were therapeutic errors and information problems. He also proved that drug classes most frequently associated with DRPs were NSAIDs, antibiotics, nasal preparations and cough medications.

Donna (2003) adapted Beers Criteria to enhance detection of unsuitable medication use among the elders. She made adjustments such as list of current medications, medical history specifications and mentioned that changes must be done occasionally because of improvements in prescribing and dispensing procedures from time to time.

2.4 RECENT STUDIES AND FINDINGS ON THE TYPES OF DRPs DETECTED BY COMMUNITY PHARMACISTS.

Unsatisfactory outcomes of treatment can be detected by careful monitoring. Of all these causes, inappropriate monitoring may be the most important and should be appreciated by the pharmacy profession (Van Mil, et al., 2001). There are three main

processes where a drug-related problem can occur as described by him which is the prescribing processes, dispensing processes and drug use processes(Van Mil, et al., 2001).

Table 2.0 shows various findings from researches done on types of DRPs detected.

Table 2.0 Findings on types of DRPs

RESEARCHER	FINDINGS ON TYPES OF DRPs
Uday (2012)	High pill burden reduces compliance with drug therapy. It also increases the possibility of adverse medication reactions.
Cheung (2009)	The research team identified that: poor, frequently untidy, handwriting; 'traps' (look-alike and sound-alike medications); lack of effective controls; and lack of concentration caused by interruptions were causes of DRPs.
WHO (2008)	Adverse effects of drugs (one DRP factor) have an extensively variable occurrence according to individual sensitivity such as nausea, dizziness, diarrhea, malaise, vomiting, headache, dermatitis and dry mouth.
Paulino, et al. (2007)	Ambiguity or short of knowledge about the intention or function of the drug was a cause of DRP.
Horne (2005)	Medication tolerance; a DRP is normally encountered when a patient's reaction to a particular drug and concentration of the drug is gradually reduced, requiring a raise in concentration to achieve the desired effect and cause non-compliance.
Stagnitti (2004)	The prescribers (pharmacists) can be influenced by external entities, such as the pharmaceutical industry, and may not prescribe the most appropriate medicine professionally which may cause DRP.
Ukans (2004)	DRPs due to misprescribing cost a lot of waste barely affordable by many people who pay for their own prescriptions
Schioler (2001)	Adverse effects a DRP factor could cause a reversible or irreversible transform, which include a raise or reduction in the vulnerability of the patient to other chemicals, foods, or treatments, such as medication or food interactions.
Leape (2000)	DRP errors originating from the interpretation of the prescription order forms were the second most frequent complaint from a list of 90,000 complaints made to the American Medical Association over a period of seven years.

**2.5 RECENT STUDIES ON METHODS TO DETECT DRPs BY
COMMUNITY PHARMACISTS.**

Community pharmacists have contributed to studies and medication reviews to reduce DRPs due to many factors. Table 2.1 shows methods created or developed by researchers to detect DRPs among patients in community pharmacies.

Table 2.1 Methods to detect DRPs developed by community pharmacists

RESEARCHER	METHODS TO DETECT DRPs BY COMMUNITY PHARMACISTS
Cheung (2009)	Barcode technology is estimated to prevent about 13,000 dispensing errors and 6,000 potential adverse drug events per year. Bar-code technology may have a positive impact on serious medication errors and deserves sturdy consideration as a tool to improve patient safety.
Haynes (2008)	Indicators are quantitative tools expressed as, rate, ratio, or percentage that evaluate actual performance, and compare it with a target or standard. These indicators measure all serious events such as DRPs that require further analysis and investigation in an occurrence such as death due to medical error.
Ostwald (2007)	The implementation of a computerized drug–drug interaction alerting system in community pharmacies and physicians' offices proved that the dispensing of prescriptions with severe interactions by pharmacists was reduced.
Zarowitz (2005)	Survey among pharmacists performing drug therapy reviews and training their patients about medication safety and poly-pharmacy, as well as collaborating with physicians and patients to correct poly-pharmacy problems. This survey led to a noticeable improvement in interactions and cost.

In the last decade, risk factors for DRPs have been identified and many methods were used to various degrees to identify patients at risk. Reliable and valid tools to correlate these risk factors to actual or potential DRPs have been developed and may be useful in community pharmacies (European Allergy White Paper, 2004). A simple process to

identify patients at risk for DRPs would increase a pharmacist's efficiency in conducting comprehensive drug assessments in patients at highest risk.

A study of southern Mexico was undertaken to analyze the scale of the inadequate drug advice provided, and to identify the contributing factors. The reasons for poor recommendation were identified as a lack of knowledge about regular treatments and authorized regulations, lack of skills among pharmacy staff and a malfunction to execute the existing regulations layering the drug sales and its retail practices. (Bernt, 2000)

In Sweden, the retail pharmacy system of community pharmacies and hospital pharmacies are grouped into one government-owned chain, recognized as Apoteket AB. A categorization system programme for reporting DRPs and pharmacy interventions was introduced in 1995 and included into the software programme of all community pharmacies in 2001. Patient medication profiles are kept in pharmacies nationwide, and a new national registered drugs list dispensed to patients became available in 2006. The coding system analyzes every section of the DRP management process; the type of problem, potential negative outcomes, pharmaceutical decisions and persons involved. Two-thirds of clinical DRPs needed a prescription alteration, the most common being an adjustment in dosage or drug regimen. (Dhalla, 2002)

In Japan, community pharmacists are currently facing a dilemma and developing strategies for dispensing mistakes, because there is growing public awareness on medical and medication events. To explain the connection between human mistakes measures and preventive measures for avoiding errors, questionnaire outcome was analyzed. This study was efficient for adopting competent preventive measures for medical and medication event and analyzing risk supervision in pharmacies (Anne, 2008).

In Britain, tools introduced by Helper and Strand facilitated self-directed learning about diseases and drugs, acquisition of relevant patient data, a consistent and stepwise approach to the identification and resolution of drug-related problems, documentation of care provided, and continuity of care (Adler, 2004).

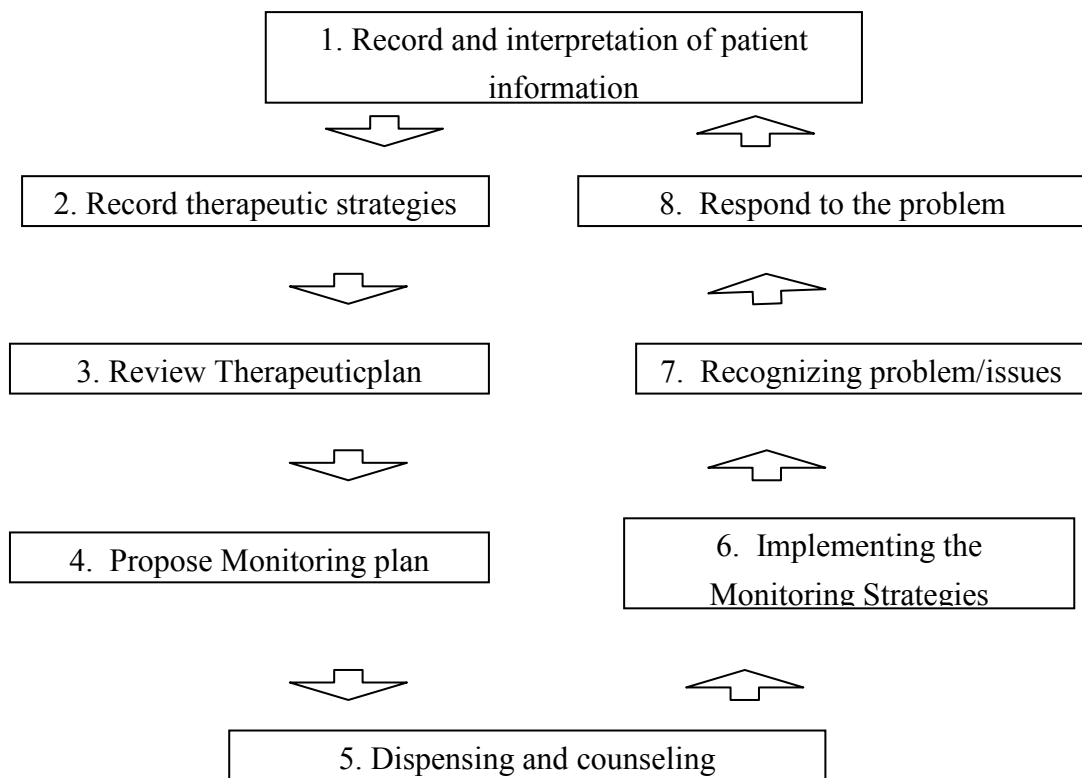


Figure 2.0- Example of a plan of DRP detection (Hepler's cycle)

Drug utilization review (DUR) is a quality assurance system that holds promise as a tool that, if implemented effectively, could enhance appropriate drug use. Evaluation and management of public and private DUR systems links documentation of processes of care, such as pharmacists, cognitive service and patient interventions (Joel, 2007).

Research to create consistent methods for measuring and monitoring the worth of community and clinical pharmacy services must be continued. Mechanisms must be developed to give confidence and reward pharmacists who without fail provide services to pharmaceutical care (Bjerum, 2003).

2.6 DEVELOPMENT OF DRUG RELATED PROBLEM (DRP)

CHECKLISTS A METHOD OF DRP DETECTION

2.6.1 SEARCH RESULTS OF RECENT STUDIES ON DRP CHECKLIST OR DRP CLASSIFICATION DEVELOPMENT

DRP classification or DRP checklist were introduced by researchers in pharmaceutical care to help health care professionals be more aware of patient care issues such as ADR or poly-pharmacy and to create a better understanding on standard medical and medication procedures. These checklist or classifications are based on evidence- based data from patients' case notes or medical histories (Bob, 2009; Andrea, 2007)

Williams (2012) developed a system for classifying drug-related problems known as (DOCUMENT) in community pharmacy was developed by research. This DRP checklist which was validated in two pilot studies was then incorporated into a software programme to be used by 185 Australian pharmacies. The system helped the pharmacists with a useful and easy-to-use tool for recording DRPs and clinical interventions.

Vinks TH (2009) explored whether a community pharmacist involvement reduces the number of potential DRPs in elderly patients. This study proved noteworthy

influence of the community pharmacist in cutting down prevalence of potential DRPs among their elderly patients.

Bob (2009) created an evidence-based checklist to identify potential drug related problems (PDRP) in patients with type 2 diabetes. With the guide of PCNE (Pharmaceutical Care Network Europe) classification, all the DRPs were detected and categorized. This was the first tool developed exclusively to distinguish potential DRPs in patients with type 2 diabetes.

Andrea (2007) developed DRP checklist to assess DRP problem management process among their pharmacies. Using the checklist, they introduced coding system that could explain the management process for DRPs. Data concerning the entire process used to deal with drug-related problems can be helpful in improving medication safety, education, and mutual care.

2.6.2 CONCLUSION OF RECENT STUDIES ON DRP CHECKLIST OR CLASSIFICATION DEVELOPMENT

The above studies which were done recently are examples of drug related problem checklist or classification development in other countries. These countries proved that the DRP checklist or classification is one useful method to survey drug related problems in a chosen setting, area, population or confirmation of the definition of DRPs in the

selected area. It could be adapted to fit the inclusion and exclusion criteria in a hospital or community pharmacies. From those studies, the checklists were able to calculate prevalence and types of DRPs. The data that was collected were useful to the healthcare providers to provide a good pharmaceutical care plan where cost and clinical interventions played a major role in the decision making in a treatment plan.

Drug related problems issues were also surveyed in our country (Elkelmi, 2011; Chua, 2012) but these survey methods did not include the development of a DRP checklist for community pharmacists.

2.7 AIM OF DRP CLASSIFICATION

Every health system needs DRP classification to document drug related problems encountered in daily pharmacy practice including community pharmacies in their country. Classification system enables documentation of DRP information when providing pharmaceutical care (including causes of DRP). Interventions will be documented systematically for further references. DRP classification also enables research of prevalence and incidence of DRPs (PCNE 2010).

There are many classifications available to code drug related problems but not all those classifications are easy to use. Van Mil, et al., (2004) published an overview of

such classifications. He mentioned that a practical classification should at least have the following characteristics:

- a) Suitable for both scientific studies and use in the pharmacy.
- b) Easy to use in daily routine.
- c) Minimally consisting of three parts: problem, intervention, and the degree to which the problem could be solved.
- d) Structured like a decision tree (main groups and sub-groups) supporting computer aided use.
- e) Open structure enabling introduction of additional coding levels without changing the basic structure.
- f) Problems defined should be clear and lead to one choice of coding only.
- g) Focus on the problem itself not on its cause or consequence.
- h) Suitable for the documentation needed for the remuneration of cognitive services.

Figure 3.0 is a summary of a few DRP classification systems created by other countries or healthcare settings and their differences in classification categories, causes, validation status and availability of intervention classification. PCNE V6.1 proved to be the most eligible and accepted by most developed countries as a standard guide for DRP detection. Other classifications had hierarchical problems, many DRP categories and most of them were not validated. So, many users had difficulties and spent more time on classifications.

System	Categories	Hierarchical problem classification*	Causes separated*	Validated*	Intervention classification*
Cipolle et al	7	N	N	N	Y
Hepler/Strand	8	N	N	N	N
PCNE V6.1	6	Y	Y	Y	Y
PIE-system	6	N	Y	±	Y
Westerlund	13	N	I	±	Y

* N=No, I=Integrated, Y=Yes, ± Not fully

Figure 3.0 Examples of available DRP classifications with their comparisons

These DRP classifications shown in Figure 3.0 have been developed or adapted according to their countries/district health system. But these systems have different