MEDICATION SAFETY OFFICER IN AN IRISH HOSPITAL: A FINANCIAL COST-BENEFIT APPRAISAL

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Abstract

Harm from medication errors and adverse drug events (ADEs) affect a significant number of patients in our hospitals. There is an additional cost to hospitals, health systems and patients from these events. Key reports have highlighted this fact and called for a change in culture and practice. A compelling case exists for hospitals to take measure to reduce harm from ADEs.

A medication safety officer is a clinical practitioner designated by the hospital to serve as the authoritative expert in safe medication use. They should be empowered and strategically positioned to lead initiatives which aim to reduce the risks inherent in medication use. They also link with national and international organisations to implement initiatives to improve patient safety.

Within the healthcare system practitioners and managers must become more aware of the financial and economic issues around the rationing of services in order to ensure that care can be directed equitably to where it is needed. Cost-benefit analysis is now an accepted method of appraisal of healthcare programmes. It is appropriate to identify whether the employment of a medication safety officer is cost-effective for a hospital.

The costs of employing a medication safety officer range from €71,096 to €97,438. The value of a potential reduction in costs associated with adverse drug events, as established in the literature, has been extrapolated. The study hospital 29,753 patient encounters would expect to incur direct costs of between €769,428 and €3,508,395 as a result of adverse drug events annually. If, as the literature suggests, 28% of these are preventable, then a potential savings of €246,329.31 to €776,950.16 exists, which, if realised, would deliver a benefit to cost ratio of between 2.5 and 10.9, which represents value for money to the institution.

In addition to this there would be significant social and economic benefits which were outside the scope of this study. Hospitals need to embrace a culture of patient safety, of which improved reporting of medication incidents forms a part. A MSO can help drive this change. Putting a financial value on medication safety helps to contextualise the benefit to hospital management and staff and provides some incentives to drive the necessary changes. However, it would be appropriate to identify baseline adverse event rates, and to appraise improvement initiatives individually to provide a more robust business case from the organisations perspective.
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1 INTRODUCTION

A significant number of patients suffer harm related to their treatment in hospitals, many of which are the result of an error (Cohen 2007). Research in North America and elsewhere has estimated that an adverse event will affect 9-13% of patients. Key reports such as the Institute of Medications “To Err is Human” (Kohn et al. 2000) have highlighted the deficiencies in our healthcare systems and suggest that a burning platform exists from which to launch a major change effort in order to protect patients. In Ireland, the report “Building a culture of patient safety” made similar findings (Maddden 2008).

Medication use is a complex aspect of healthcare provision and a significant proportion of the harm experienced by patients is as a result of adverse events in the prescribing, dispensing, administration and monitoring of medications. Such harmful events may include medication errors or adverse drug reactions, and are the most commonly occurring type of iatrogenic injury (Kohn et al. 2000).

The Audit Commission, in their report “A Spoonful of Sugar” (2001) investigated the medication use process, specifically in British hospitals, and emphasised the role of medicines management at the centre of clinical governance. They saw managing medication safety risks as a key strategic challenge.

Medication safety incidents may be medication errors or near misses, and may lead to adverse drug events or adverse drug reactions. Definitions for these terms have been included in Appendix I.

![Diagram](image_url)

Figure 1: Relationship between medication incidents, Adverse drug events and adverse drug reactions (adapted from Nebeker et al. 2004)
Not all medication errors or incidents lead to adverse drug events, or indeed adverse drug reactions. Medication errors are in fact much more common than adverse drug events, but they result in harm less than 1% of the time (Lisby et al. 2010). About one quarter of adverse drug events are due to medication errors (Bates, Boyle, et al. 1995). However, errors and near misses, if measured, investigated, and understood, can assist us in reducing those adverse drug events which are preventable and by doing so, avoid the outcome of adverse drug reactions which cause harm.

In addition to the human cost of medical error, “To Err is Human” also suggests that adverse events have a financial cost to the healthcare institution and an economic cost to society (Kohn et al. 2000). The economic cost attributable to these events has been investigated in the literature, notably by Samp, Touchette, Marinac, & Kuo, (2014). Costs can be born economically or socially by society but there are also financial costs incurred by the hospital or healthcare institution. These costs can be in providing treatment for harm caused by the error in the form of antidotes or supportive care; prolonged hospital stay while recovering from the error, or transfer to a higher dependency setting.

In Ireland in excess of €60 million was paid out in 2009 to patients and families of some of those harmed by medical incidents by the Clinical Indemnity Scheme on behalf of public hospitals (O’Cionnaith 2009). It has also been estimated that the economic costs of medical error in Ireland are up to €350 million per year (Cullen 2013; McDowell 2013) which is a significantly greater than the €135 million which appears as a transfer to the state claims agency in the accounts of the HSE (Health Service Executive 2013a).

These financial considerations add to the already compelling for a hospital to take measures to reduce medication errors and the harm from such errors by implementing a medication safety programme. Such a programme would require innovative leadership from someone knowledgeable in the medication use process to drive error prevention strategies. A Medication Safety Officer (MSO) is a clinical practitioner designated by the hospital to serve as the authoritative expert in safe medication use. The fundamentals of medication safety should be a critical part of the medication safety officer’s job description and they should be empowered and strategically positioned to lead efforts to reduce the risks inherent in medication use (Alexander et al. 2013). In England, the National Health Service (NHS) has directed all larger healthcare organisations to identify a MSO, and sees such persons as "integral to improving medication error incident reporting and learning within healthcare provider organisations" (HPRA/NHS, 2014).
MSOs have been employed in a number of hospitals in Ireland over the past decade (Relihan et al. 2012). These appointments appear to have been on the basis of quality improvement. Their role is in promotion of safe use of medications in their organisations, and to link with national medication safety networks in order to implement initiatives so as to improve patient safety in the use of medications.

The Midland Regional Hospital at Tullamore (MRHT) is a 275 bed tertiary hospital serving a regional population of about 250,000 people with specialties such as orthopaedic surgery, medical oncology, haematology, otolaryngology, nephrology and rheumatology. There were 29,753 inpatient discharges and day cases in 2014, with an average length of stay of 5.19 days. Medication incidents are reported by pharmacists and other staff within the hospital using existing risk management structures. No published data exists on the actual number of medication incidents reported in the hospital.

Reducing harm from medication errors can provide a financial benefit in addition to improving the care of patients. Employing a MSO as part of a programme of medication safety could deliver some financial benefit (Saine 2010a; Seng Wu 2010; Saine 2010b). This study aims to look at the work of MSOs in order to evaluate whether the potential financial benefits to hospitals would outweigh the costs of creating such a role. An objective will be to identify whether it would be worthwhile to create medication safety pharmacist posts in an Irish Model 3 hospital. The full financial cost of appointing a MSO can be set against the benefits that would be obtained by the reduced need for supportive and corrective treatment and reduced length of stay in patients who suffer harm and a reduction in compensation paid by the hospitals insurers.

Robust financial data of this nature should inform hospital management in fiscal terms of the cost and benefits of establishing the role of medication safety officers. This should assist in the service planning process, and inform us if the role can be justified by cost savings in addition to the many quality and safety benefits that have already been established.
2 LITERATURE REVIEW

The literature on medication safety includes a number of landmark reports in various countries, as well as a concentration of papers in clinical pharmacy journals and journals in the quality and patient safety areas, with some high profile papers appearing in the mainstream high impact journals. The EBSCO host and Emerald databases, and specific clinical pharmacy journals were searched using the search terms: “Medication Safety Officer,” “Financial Appraisal” and “Economic Appraisal” Searches were also supplemented and validated in discussions with medication safety experts in Ireland.

2.1 MEDICATION ERRORS AND ADVERSE DRUG EVENTS

2.1.1 BACKGROUND

Medication errors have been a subject of interest to pharmacists for a considerable period of time. Studies have consistently shown positive healthcare quality benefits from pharmacist involvement in a variety of healthcare settings (Touchette et al. 2014). As well as the issue of poor patient care, the scope of the problem of medication errors also includes economic problems such as increased length of stay, corrective treatment and malpractice legal claims (Flynn 1999). Hospital pharmacists have worked to reduced patients risk of harm for over 6 decades with initiatives such as clinical pharmacy services and centralised aseptic compounding services (Alexander et al. 2013).

A variation exists in the terminology used in the literature and practice for medication errors which can contribute to the variability in outcomes recorded (Nebeker et al. 2004; Lisby et al. 2010). Key definitions have been discussed in Appendix I belowof this document. Two key terms stand out in the literature, Adverse Drug Event (ADE) and medication error for which a comprehensive definition has been agreed by the National Coordinating Committee of the Medication Error Reporting Service (NCC MERP) and adopted by the Irish Medication Safety Network and by several Irish Hospitals (Kirke et al. 2007; Irish Medication Safety Network n.d.).

Landmark reports such as the Institute of Medicine’s “To Err is Human”, (Kohn et al. 2000) shook the medical community at the turn of the millennium with the assertion that as many as 98,000 patients in the United States of America were dying each year as a result of medical errors. The report also highlighted that direct and indirect costs are
borne by society as a result of medication errors (Kohn et al. 2000, p.40). Almost one in fifty patients admitted to two prestigious teaching hospitals experienced harm from a medication error or a preventable drug event, with an average increased length of stay of 4.6 days and a cost of US$4,700 each, at 1995 prices (Kohn et al. 2000 quoting Bates, Cullen, & Laird, 1995). These errors also contribute to severe reputational damage to hospitals (Kohn et al. 2000, p.42) which can have financial implications.

A recurring theme in the literature is that systems failure, and not human error are responsible for most injuries, and that the most effective method to improve safety or quality overall is to change those systems (Bates, Cullen, et al. 1995; Leape 2007; Kohn et al. 2000; Leape & Berwick 2005). Smith (2004) suggests that this highlights the need for recording and measuring adverse drug events and disseminating the learning.

In the UK, The Audit Commission published “A Spoonful of sugar” where, among other medication related issues they stated that medication errors were unacceptably common and that the status quo was unsustainable. The document emphasised the need for more pharmacist involvement in patient safety. The commission found that a barrier to improving safety was that many boards are concerned with short term financial targets and were unable or unwilling to invest money to achieve sustainable quality improvements (The Audit Commission 2001). This was reflected, although less clearly stated, also in an Irish Report on Value for Money in the health Services (Deloitte & Touche & The York Health Economics Consortium 2001) and was also reflected in the adverse findings of the Report of the Mid-Staffordshire NHS Trust enquiry (Francis 2013).

Two reports specifically dealing with medication safety followed, “Building a safer NHS for patients: Improving medication safety” (Smith 2004) and “Safety in Doses: Improving the use of medicines in the NHS” (NHS National Patient Safety Agency & NHS National Reporting & Learning Service 2007), after the establishment of National Patient Safety Agency (NPSA) as an “arms-length” body of the Department of Health from 2001 to 2012. During its years of operation the organisation collected large amounts of data through the National Reporting and Learning Service on medication safety incidents in hospitals in England and Wales. Incidents involving medications represented 9% of those reported in 2007 including 100 reports of death or severe harm (NHS National Patient Safety Agency & NHS National Reporting & Learning Service 2007).

In Ireland “Building a culture of patient safety” (Maddden 2008) recommended that there should be a national analysis of the problems and potential solutions and called
for governance systems which had oversight over medication safety issues, which would suggesting a role for medication safety officers (Maddden 2008, para.3.2.2) The report saw that Ireland did not have the framework in place to respond quickly and effectively to errors by analysing causes and disseminating learning despite having a professionally trained and highly motivated workforce in place.

Hughes, (2000) K. Bates et al., (2010); Kirke, (2009) and Kirke et al. (2007) have shown that medication errors are also common in Irish hospitals, although no specific measure to identify their incidence as a proportion of patients encounters was carried out. Bates included data on 27% of individual prescriptions having the potential to cause prescribing errors due to omission or illegibility of details.

Internationally, most pre-marketing drug trials by their controlled short term nature do not reflect real world situations and will fail to identify unexpected adverse drug effects which might occur when the medication is used in real-world situations. Inappropriate use of new medications is also not captured in these trials and identifying problems which might occur in clinical practice can be difficult (Sultana et al. 2013).

Blumenthal & Ferris (2004) see the creation of a business case for quality as being central to improving the functioning of our health care system, and the absence of any evidence to managers and policy makers that a return on investment will be seen as a major obstacle to making patients safer. This goes to the core of health economics, given that it can be difficult for consumers to perceive quality differences in healthcare, unless a serious adverse event occurs.

2.1.2 FINANCIAL OR ECONOMIC COSTS OF MEDICATION ERRORS

UK data suggests that over £2.5 billion (€3.4 billion) is spent on medication errors which are preventable, many of which are related to the improper use of medication. (Frontier 2014) No such estimates exist for public hospitals in the Republic of Ireland.

Bates et al., (1997) building on Bates, Cullen, et al. (1995) focussed on the costs of caring for patients who had experienced an adverse drug event, finding that preventable events, or medication errors were generally more severe, and associated with almost twice the cost, suggesting that a significant sum of money could be saved by any measure which might improve medication safety. Adverse drug effects have been attributed with considerable economic as well as clinical costs, due to increased lengths of stay, additional hospital admissions and clinical investigations.
The cost of medication errors identified by clinical pharmacists has been evaluated in the US as part of the MEDAP study, where a decision model was developed to estimate the economic impact. The study estimated that all medication errors, and not just those which cause harm, have an approximate cost to the institution of approximately US$89. It was suggested that initiatives to reduce the risk and inefficiency of errors, such as employing a medication safety officer would require a better understanding of the costs of medication error. The evidence that action needs to be taken on reducing errors, based on the economic cost, was found to be compelling (Samp et al. 2014).

While it is widely accepted that the cost of medication errors in hospitals is high, there have been very little in the way of robust research to identify that cost, either in Ireland or Internationally. Pinilla, Murillo, Carrasco, & Humet (2006) attempt to do so in a Spanish hospital identified an additional median cost of €1,641 per case (where there was an adverse event), with patients staying an average of a week extra in hospital. Patient level costing data was available in the study hospital which allowed for the increased cost for patients who suffered a medication incident to be identified.

A limitation in interpreting the cost data in many of these studies would be that they are set in hospitals and healthcare systems which are run as for-profit organisations, with payment for healthcare being provided by external organisations. Payment in the Irish system is by a fixed budget from central government adjusted to a small extent (20%) with reference to Case-mix data based on Diagnostic Related Groups (Casemix Unit 2005). Reimbursement as such, is not a factor in the Irish system and any incentives to improve patient care in this way would not be as relevant. The legal costs of reducing medication error incidence are also less relevant in a financial appraisal focussed on an Irish hospital budget, as such costs are managed nationally through a state claims agency (National Treasury Management Agency n.d.). Including such costs might be relevant in an economic discussion on the subject.

### 2.2 ROLE OF A MEDICATION SAFETY OFFICER

The Institute of Medicine (IoM), American Society of Health-System Pharmacists (ASHP) and other international organisations have advocated for a medication safety officer (MSO) with responsibility for improving medication safety throughout hospitals. Stated simply, the scope of the role is to reduce harm, through leadership, medication safety expertise, influence practice change and research and education (Saine & Larson 2013).
A medication safety officer is a clinical practitioner designated by an organisation to serve as the authoritative expert in safe medication use (Alexander et al. 2013). The individual should be a leader and patient safety advocate who puts patients first, before any specific department or profession, and exhibits an unyielding passion for patient and medication safety above everything else. They must challenge the organisation to review all medication processes and systems to reduce risk, while always bearing in mind that the medication use process ends at the patient (Kowiatek 2011). Many strategies exist to reduce the occurrence of specific medication errors, but overall systematic and cultural change can benefit from a named individual within an organisation being given responsibility for medication safety. The goal of medication safety officers is to focus on improving systems to prevent future errors (Karpa, 2001). An MSO is also an ideal staff member to manage and analyse medication error data and safety initiatives, and participates in the development of implementation strategies, work that many pharmacy departments would already have some experience with (Kowiatek et al. 2004).

An MSO can reduce medication error rates through leadership; expertise in the area of medication use and safety, driving practice change, research and education. They can achieve this in organisations by encouraging and then monitoring medication error reports and carrying out targeted actions informed by such data in order to bring about measurable and continuous improvement in the Hospital’s medication procedures (Larson & Saine 2013). Improved reporting and analysis of medication errors, through improving safety culture, has also shown a reduction in harm in some settings (Abstoss et al. 2011) which would be an important part of the role of an MSO. More analysis and organisational learning has been called for in response to reporting (Anderson et al. 2013) and this too would be improved by an MSO and a medication safety committee who would improve focus on safety and communicate back to the relevant stakeholders.

In a patient safety alert in March of 2014, the medicinal products regulator and the Health Service in England issues a directive that all healthcare providers should identify a medication safety officer and provide their details to a new national network of medication safety officers. They did this in order to clarify medication safety roles and to improve learning both at a national and a local level (MHRA & NHS England, 2014).

Much of the research and focus on driving the medication safety agenda with a dedicated staff member has taken place in clinical pharmacy literature, driven by organisations such as the ASHP who in 2001 expressed an aim that there would be a
medication safety officer in every hospital (Karpa, 2001). In a 2008 survey, one in every three American hospitals reported having a pharmacy staff member with specific responsibility for medication safety (Bond & Raehl 2008), although a later study showed that the economic downturn had forced half of hospitals surveyed to reduce time spent on medication safety activities (Institute for Safe Medication Practices 2010). This would appear to be the result of a short-term outlook that might drive increasing costs in the longer term, due to a failure to reduce medication errors (Saine 2010b).

Professions other than pharmacy have been considered by some organisations as medication safety officers, but the US National Quality Forum and the Institute of Medicine have suggested that “pharmacy leadership structures and systems ensure a multidisciplinary focus and a streamlined approach to achieve organization-wide safer medication use” (Meyer et al. 2010). A successful medication safety programme requires a dedicated, willing pharmacist leader, able to look at medication management with a systemic view and step into an active role on the administrative leadership team (Burgess et al. 2010). Experience with clinical pharmacy and pharmacy operations can be useful, and the practitioner needs to be an expert in medication processes (Kowiatek 2011).

Reporting structures have also been discussed with MSOs reporting either within the pharmacy department or directly to hospital management through a patient safety or quality structure. Both approaches have advantages, but removing the core pharmacist tasks from a MSOs workload may reduce their perspective on the implementation of practical medication safety changes (Saine & Larson 2013, p.6).

Job descriptions have been published by the ASHP for medication safety officer positions (American Society of Health-System Pharmacists 2015). Variations on the title medication safety officer have been used with the words medication and drugs being interchangeable, and the word “officer” being replaced with facilitator, pharmacist, manager or leader.

A number of international organisations exist supporting the work of MSOs. The Association of Medication Safety Officers was in 2013 acquired by the Institute of Safe Medication Practices (ISMP) and became the Medication Safety Officers Society. The organisations mission is “to advance and encourage excellence in safe medication use by providing communication, leadership, direction and education among its members” (Medication Safety Officers Society n.d.). The ISMP itself is a non-profit organisation devoted to medication error prevention and safe medication use. The ISMP has
affiliates in a number of countries worldwide (Institute for Safe Medication Practices n.d.).

In Ireland medication safety officers have been in position for over a decade in larger hospitals, and a selection of these job descriptions have been anonymised and recreated in Appendix II of this document. A model of an ideal medication safety programme has been designed based on experiences in the sector over time (Relihan et al. 2012). These MSOs and other colleagues have formed a voluntary group, the Irish Medication Safety Network which meets regularly and provides support and direction for medication safety initiatives in Ireland (Irish Medication Safety Network n.d.).

In the HSE Acute Hospital Division Operational Plan medication safety has been made a priority, with an action for 2015 that hospitals ensure all medication errors are reported. This will be measured as variance from the mean number of reports made by hospitals to the States Claims Agency (Health Service Executive 2015).

### 2.3 FINANCIAL APPRAISALS OF MEDICATION SAFETY OFFICERS

#### 2.3.1 NEED FOR FINANCIAL APPRAISAL

Healthcare managers have to become more aware of the financial and economic issues surrounding the rationing of service in order to ensure that such care goes to where it does most good, and as a result we put a value on our own and others health (Donaldson 2011, p.3; Higgins 2013). It has been suggested that the Irish public would prefer lower taxation to better services (Collins 2014). All clinical and public health areas need to seriously consider focussing on economic evaluations, looking at the efficiency of health care programmes through cost benefit analyses or cost effectiveness analysis. These are now an accepted method of appraisal of health care programmes, although their use is still quite rare, probably because of lack of understanding of the basic principles involved in such research (Donaldson 2011, chap.6).

Despite the implementation of patient safety practices being increasingly commonplace, economic evaluations are rare. Information about the cost-effectiveness of these practices is crucial for making evidence based decisions regarding the allocation of the limited resources in healthcare (Alves de Rezende et al. 2012).
Systemic reviews have taken place to identify practices in clinical pharmacy which are cost effective in improving patient safety (Gallagher, McCarthy, & Byrne, 2014, Samp & Touchette, 2014, Touchette & Doloresco 2014). However, all such reviews seem to conclude that sufficient robust and new studies of quality improvements in the field of pharmacy do not appear to be taking place, despite consistent evidence for the positive cost benefit in clinical pharmacy. None of these studies identified any cost-benefit studies of the medication safety role itself.

Kinninger & Reeder (2003) call on those involved in medication safety to use the tools and language of finance in planning investments, in much the same way as organisations would with any other investment. They found that it made good business sense for some decisions to be made which includes intuitive judgements on whether an investment in medication safety is worthwhile, and that a full detailed calculation of return on investment could be difficult to carry out. They did however also make the point that better medication safety can also deliver intangible benefits such as increased satisfaction of healthcare staff.

2.3.2 PERFORMING A FINANCIAL APPRAISAL

Improved quality in healthcare delivery should be a significant source of savings, although the amount that can be saved by different organisations may be difficult to estimate. Tools such as the “Health Care Quality Calculator” have been devised. This tool is suited to determining costs of poor outcomes within single institutions. Once a project to improve quality has been identified, the impact on number of patients affected, length of stay the calculator can determine expected savings or loss (Yarbrough et al. 2013).

The Institute of Healthcare Improvement have developed an “Adverse events prevented calculator.” This allows the user to track the change in rate of an adverse event over time, as well as the change in deaths prevented and cost savings (both actual and potential) as well as the return on investment of quality improvement work targeting adverse events. Primarily the role of the tool is to allow clinical staff to convert the value of quality improvement work into terms which are applicable to financial decision makers (Institute for Healthcare Improvement n.d.).

Samp et al., (2014) used a simple decision tree model to calculate the costs and consequences of medication errors identified by clinical pharmacists. These are a common tool in economic analysis, used to estimate a weighted average effect and a cost for all modelled outcomes. Nodes are used to represent all possible events, and these nodes are linked together in “event pathways.” A probability and a cost can be
attributed with each node or decision, and then the cost can be multiplied by the probability giving an overall cost for the event. All the terminal values can then be added together to give an average effect.

One area where studies have taken place on the potential cost savings from quality improvement projects is in the prevention of healthcare associated infections. The APIC-TMIT Cost of healthcare infections calculator is an example of a tool which allows just this. The tool uses robust point estimates from published literature which are well grounded in scientific methods and adjusts them based on cost data from national databases (Texas Medical Institute of Technology (TMIT) & APIC 2011).

The Department of Public Expenditure and Reform have produced a suite of documents for the evaluation of public projects, and their document on cost-benefit appraisal (Central Expenditure Evaluation Unit 2012b) could be particularly applicable to this study.

Many of the literature based on healthcare systems where to a large extent hospital costs are paid by insurance companies, such as in the United States of America, may be of limited application in Ireland. There would be no financially realisable competitive benefit to having a good medication safety profile in an Irish regional general hospital, as patients would not have a choice to obtain healthcare elsewhere. However, discussions on resources wasted in healthcare, and the appropriateness for calculating return on investment in healthcare quality improvement are still relevant and must be considered in individual institutions (Kaplan & Porter 2011).

2.4 CONCLUSION

Given the cost of medication errors in healthcare, there is a compelling case to investigate whether an initiative such as the employment of a medication safety officer would be cost effective. The financial implications of implementing this change must be better understood so that it can be clear that improving quality does deliver a return on investment (Leatherman et al. 2003). CEOs and finance officers are responsible for the delivery of value, and it is at this level where decision are made on spending money which will deliver patient safety. An attempt must be made by clinicians to speak the language of finance in order to convince these stakeholders (Institute of Medicine 2008; Meltzer 2012). Methodologies and calculators do exist which allow us to estimate, within an appropriate range whether it is worth it to make quality improvements. These tools should be used by clinicians and managers alike when making decisions which have an opportunity cost in healthcare.
3 METHODOLOGY

3.1 INTRODUCTION

Modern societies wish to limit what they spend on healthcare and the business case for spending in the healthcare needs to be made in terms of efficiency as well as equity and quality. It is inevitable that choices must be made regarding how a hospital will spend resources, as, by spending resources on a medication safety officer (MSO) there will be an opportunity cost on other services within the hospital (Donaldson 2011, p.1). Medication errors have been found to be costly to healthcare systems internationally (Samp et al. 2014) but a secondary review of the data published in Ireland and internationally would be appropriate to identify if a hospital can reduce these costs by employing an MSO.

Analyses that measure the both the costs and consequences of alternatives in monetary units are known as “Cost-Benefit Analyses” (Drummond et al. 2005, chap.2) although the term is generally reserved for analyses where the social and economic value of the consequences of a programme are evaluated. The cost-benefit of a project is considered worthwhile if the Pareto criterion is satisfied, which means that the best course of action is one which benefits some people without causing loss to anyone (Mulreany 1999, p.202).

This appraisal will consider the financial costs and benefits of introducing an MSO to the Midland Regional Hospital at Tullamore (MRHT). The costs will include the human resources costs of employing an individual to carry out the role, and will also estimate a range of other costs that might also accrue. The benefits will be estimated by adding together costs which might be incurred should an MSO not be recruited. These would include the cost avoided by not incurring medical claims, reduction in patient encounters, whether by length of stay or readmission and reduction in direct costs, such as spending on antidotes and other rescue treatments. As the review is taking place “ex-ante” or in advance of the creation of an MSO post, the correct term is an appraisal (Mulreany 2005, p.1).

3.1.1 FINANCIAL APPRAISAL

This appraisal, as a business case for an individual hospital to establish whether a case exists to employ an MSO, takes a financial or commercial perspective. This differs from a full economic appraisal which would focus on the point of view of the
Government and would consider a social and a fiscal perspective (Institute for Transport Studies 2003).

Meltzer (2012) argues that being able to support evidence of cost savings from a medication safety initiative creates a win-win situation where economic and financial concerns of organisations are met. He discusses the opportunity cost of these quality measures and asks whether it is more appropriate in some cases to spend money when perhaps the same money can be used elsewhere to reduce morbidity and mortality to a greater degree. Pharmacists have for some time considered cost effectiveness as of equivalent importance to safety and efficacy, and indeed the modern definition of pharmaceutical care includes all three being given equal prominence (Allemann et al. 2014).

The Institute of Medicine Board on Health Care Services in 2008 convened a symposium on “Creating a business case for quality improvement research.” (Institute of Medicine 2008). It was found that Institutional reluctance to invest in quality improvement or documentation of outcomes from quality improvement caused by limited resources remains a barrier to progress.

This study uses the perspective of measuring the savings in costs directly incurred by the hospital should an MSO be employed. If, as Bill Clinton famously used as a 1992 US Presidential election slogan, “it’s the economy, stupid” then it makes sense to consider the direct economic effects on the budget holders of any proposed improvement in quality before introducing change. This narrow basis for identifying costs and benefits is important as the opportunity cost of the spending incurred by employing an MSO will be felt in the hospital budget. In situations of scarcity, it is appropriate to look at the cost of any new development and to ensure value for money is being achieved in addition to balancing spending against other possible applications of the hospital budget, which may have a greater effect on morbidity, mortality or patient safety. Narrowing the scope of the study can reduce the amount of work which must be carried out in an evaluation and leave the possibility that a broader study can be contemplated at a later date (Drummond et al. 2005).

### 3.1.2 HARD AND SOFT FINANCIAL SAVINGS

It has been argued that something in the economic approach to healthcare decision making is not compatible with traditional medical ethics (Lucas 2005). There may be a problem in identifying quality improvement value in healthcare as much of the savings may be “soft dollar” savings. “Soft dollar” savings are those realised by not spending,
or by saving time*. These are savings where there is an identifiable effect on operations, but cash flow affected indirectly; or where it is difficult or impossible to identify effect on cash flow. These compare with “Hard dollar” savings come from tangible and identifiable saving as opposed to that realized from not spending, such as a definite and easily quantifiable effect on cash flow, timing is short term (months or 1-2 years) and there is transaction based evidence. Introducing a medication safety officer (MSO) would be in the category of a longer term realisation of financial benefits (Swensen et al. 2013) The Institute of Healthcare Improvement (IHI) uses the terminology of dark green and light green savings in place of hard and soft dollars (Griffin & Resar 2009).

3.1.3 STUDIES WHICH QUANTIFY THE BENEFITS OF MEDICATION SAFETY OFFICERS

A literature review was carried out with the objection of identifying if there were any references for economic or financial appraisal, evaluation or any other analysis for medication safety officers, or general error reduction strategies. A search strategy was designed to search within the Pub Med, Emerald, CINAHL databases, in addition to the journals Pharmacotherapy, The International Journal of Clinical Pharmacy, and the AJHP, which are not indexed in either of the above databases. The grey literature in the Lenus Irish Health Database and HPAI research database were examined, and a request for information was made to the Irish Medication Safety Network and to the Medication Safety Officers Society (via their online forum).

Search terms used were “Medication Safety Officer, Medication Safety Pharmacist, Medication Safety Facilitator” in addition to separate searches for Appraisal AND Healthcare; and Healthcare AND “cost benefit.” Article titles and subsequently abstracts were evaluated for suitability. In the absence of economic endpoints, clinical or quality endpoints were sought which could be used in identifying costs with reference to local data. This literature review can be found in Chapter 2.

* http://www.businessdictionary.com/definition/soft-dollar-savings.html
3.2 IDENTIFYING COSTS

3.2.1 COSTS OF EMPLOYMENT

The salary costs for an MSO can be established from pay scales agreed between the Irish Government and social partners, which are available from the HSE website (Health Service Executive 2013b). It will be necessary to establish a range of costs, from those for pharmacist grades, nursing grades and also for administrative grades appropriate to a member of staff who would have reporting relationship with existing hospital staff, for example a director of quality, Superintendent Pharmacist, Clinical Director.

It will then be necessary to adjust these costs to include the employer contribution to Pay Related social insurance and pension costs (Central Expenditure Evaluation Unit 2012a).

An adjustment for other resources which an additional staff member would consume would also be useful, although establishing a marginal cost for an additional staff member can be difficult, given that direct accounting approaches such as activity based costing are not consistently practiced within Irish hospitals (PA Consulting Group 2012, p.15).

3.2.2 COSTS OF DELIVERING MEDICATION SAFETY RELATED CHANGES

There will also be costs to the organisation from implementing the changes introduced by an MSO. These improvements in care driven by alerts and best practice reports in the international literature have a local impact on the purchasing cost of consumables, staff and medication. It would be appropriate to prepare a cost benefit analysis for each of these interventions; however, this would be outside the scope of the present study. A number of useful tools have been developed and these have been discussed in section 2.3.2 on page 12 of this thesis.

An example of such costs would arise when implementing a policy where 100ml bags of Glucose 20% are used in preference to 50ml bottles of Glucose 50% in order to reduce the risks of thrombophlebitis to the patient incurs an increase in purchasing cost in addition to the cost and time taken in educating nursing and medical staff who are more accustomed to the 50% preparation.
A properly resourced medication safety officer would also need access to computer and library resources which might not otherwise be available. These costs should also be added to the cost of employment.

3.3 BENEFITS

3.3.1 ALLOCATING A FINANCIAL VALUE TO ADVERSE DRUG EVENTS

One objective of an MSO is to work to ensure optimal patient outcomes from drug therapy by identifying risk in the medication management process and by making recommendations for process improvements designed to prevent or minimise adverse drug events (American Society of Health-System Pharmacists 2015). Identifying the magnitude of potential risk reduction by MSOs should provide data to which costs could be allocated. A reasonable annual workload of the actions of an MSO can be identified, and tabulated. A likely range of incidence of adverse drug effects (ADEs) will then be identified from the literature. The incidence of ADEs in an MRHT will then be estimated by looking at data from the UK and the United States as well as a small number of references from the Irish healthcare system which might provide some internal validity (Bates et al., 2010; Kirke, 2009; Kirke et al., 2007).

3.3.2 POTENTIAL SAVINGS FROM REDUCED LITIGATION

The costs to the hospital from legal claims awarded against them by the courts can be considered as contributing to the financial costs of medication errors to a hospital. In public hospitals in Ireland, personal injury claims are handled by the state claims agency, a function of the National Treasury management agency. The Clinical Indemnity Scheme was established in 2002 to transfer responsibility for managing clinical negligence claims to the state (National Treasury Management Agency n.d.). The Health Services Executive, which has responsibility for delivery of healthcare in Ireland, makes an annual provision of in their accounts which is transferred to the National Treasury Management Agency. The amount paid by the Health Services Executive to the state claims agency is included in the annual report, and was €135,874 in 2013 (Health Service Executive 2013a). This figure has been challenged by economists as being too conservative (McDowell 2013).

This provision takes place at a national level and does not affect the accounts of the hospital. No benefit would accrue to the hospital in terms of reduced insurance
premiums should the amount incurred by the hospital be reduced. All potential savings from litigation occur at a national level, and will not be considered in this study.

### 3.3.3 POTENTIAL SAVINGS IN REDUCED BED DAYS

A number of sources in the literature have attempted to assign costs to medication errors and adverse drug events by multiplying the number of events by the total expected increase in patient bed days per event, as these events have been shown to increase average length of stay and readmission rates to hospital (Davies et al. 2009).

A cost for an average inpatient bed day and an Intensive care bed day can be established from published annual Casemix returns, which are used in the Republic of Ireland to measure and compare outputs, costs and complexity in the hospital system by classifying patients into diagnostic related groups (DRGs) which share common clinical attributes, and as a result similar patterns of resource use (Casemix Unit 2005).

These were identified in the literature review and a range of costs was established for medication errors that could be reduced by the actions identified from the MSO job description. It may be difficult to realise cost savings achieved by reduced bed days, given that many hospital costs, including human resources are fixed costs. However, it might be possible to identify if additional elective patients can be treated by freeing inpatient beds, by examining waiting list data for the hospital.

### 3.3.4 POTENTIAL SAVINGS IN DIRECT COSTS

Where harm from a medication error results in the need for a patient to receive more intensive treatment, for example transfer to an intensive care unit (ICU), the cost of ICU bed over and above the cost of a general inpatient bed will be established.

The purchase cost of antidotes and other treatments used to treat adverse events will also be identified, as will the cost of providing other supportive care. The methodology used to identify these costs will be that of identifying the costs of antidotes identified in the Medication module of the UK version of the “IHI Trigger tool” (Institute for Healthcare Improvement & NHS Institute for Innovation & Improvement 2008). The IHI is a not-for-profit organisation which aims to pursue strategies for evidence based improvements in healthcare. A “trigger tool” is a methodology which uses sentinel signals or “triggers” identified within the hospital which allows for the detection of adverse drug events (Griffin & Resar 2009). Costs were established using data from pharmacy dispensing software, CliniScript.NET Version 7.4.7 (Helix Health Ltd., Dublin).
TABLE 3-1: LIST OF TRIGGERS AND PROCESS IDENTIFIED (MODIFIED FROM TABLE 1 OF ROZICH, HARADEN, & RESAR, 2003)

<table>
<thead>
<tr>
<th>Trigger</th>
<th>Process Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2</td>
<td>Vitamin K</td>
</tr>
<tr>
<td></td>
<td>Over anticoagulation with warfarin</td>
</tr>
<tr>
<td>T3</td>
<td>Flumazenil</td>
</tr>
<tr>
<td></td>
<td>Over-sedation with benzodiazepines</td>
</tr>
<tr>
<td>T5</td>
<td>Naloxone</td>
</tr>
<tr>
<td></td>
<td>Over-sedation with narcotic</td>
</tr>
<tr>
<td></td>
<td>Glucagon</td>
</tr>
<tr>
<td></td>
<td>The administration of these agents might mean that the patient has experienced an adverse event related to hypoglycaemia.</td>
</tr>
<tr>
<td></td>
<td>Glucose 50% (or 20%)</td>
</tr>
</tbody>
</table>

There is a need to ensure that double counting does not occur as some of these direct costs would be included in the increased cost of a hospital bed day (Drummond et al. 2005).

3.4 COMBINING THE DATA

Having quantified and identified the costs and benefits, it is then appropriate to use a performance metric or decision aid to differentiate between the option of employing an MSO, or not (Central Expenditure Evaluation Unit 2012b). As this appraisal assumes the costs and benefits of the role should accrue during or close to the same year, discounting to net present value and internal rate of return need not be used. The costs and benefits will be tabulated, a range of benefit-cost ratios identified and sensitivity analysis carried out.

It is important to present and communicate a sensitivity analysis clearly so as to show how significant the effect of changing the variables and assumptions around which a recommendation is being made may affect outcome. Sensitivity analysis describes the process of establishing how sensitive the outcome of a cost-benefit analysis is to changes in the value of the input variables (Central Expenditure Evaluation Unit 2012b).
4 RESULTS

There were 29,753 inpatient and day hospital admissions to our hospital in 2014. It would be expected that medication errors, near misses and adverse drug events would occur to a proportion of our patients at rates comparable to those in the literature. Appointing a medication safety officer (MSO) has been suggested as a means by which these events could be reduced. The costs of an MSO, and potential benefits, based on expected adverse event rates have been calculated here in order to identify if a positive benefit-cost ratio exists for the post. This could inform a business case from the perspective of the hospital, as to whether an MSO should be appointed.

4.1 STUDIES QUANTIFYING THE CLINICAL BENEFITS OF MEDICATION SAFETY OFFICERS

The researcher was unable to identify any studies which could empirically establish clinical or quality benefits of medication safety officers. One study develop and measure performance indicators of medication use within their organisation to define the benefits of the position, and showed an increase in medication error reporting from 0.58 to 4 reports per 100 admissions (Kowiatek et al. 2004).

An electronic search of MEDLINE articles published (Kilpatrick et al. 2005) found that less than 1 in 100 articles identified contained quality improvement processes included information which could be used to calculate a return on investment. This supports the view that quality improvement initiatives, such as the introduction of MSOs require additional studies and measurement of outcomes to ensure that they are cost effective.

4.2 COSTS

4.2.1 COSTS OF EMPLOYING A MEDICATION SAFETY OFFICER

A list of the recruitment cost of different grades of staff who might be employed as medication safety officers has been included in Table 3-1. These costs have been adjusted to take costs such as employer Pay Related Social Insurance and imputed pension costs and overheads into account, in line with Irish Government policy (Central Expenditure Evaluation Unit 2012a).
TABLE 4-1 COST OF EMPLOYING A MEDICATION SAFETY OFFICER (HEALTH SERVICE EXECUTIVE, 2013)

<table>
<thead>
<tr>
<th>Grade of Staff</th>
<th>Mid point of salary scale</th>
<th>Total Salary Cost†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chief II Pharmacist</td>
<td>€69,723</td>
<td>€97,437.89</td>
</tr>
<tr>
<td>Senior Pharmacist</td>
<td>€63,979</td>
<td>€89,410.65</td>
</tr>
<tr>
<td>Administration Grade VII (One grade below quality officer)</td>
<td>€52,314</td>
<td>€73,108.82</td>
</tr>
<tr>
<td>Advanced Nurse Practitioner</td>
<td>€61,210</td>
<td>€85,540.98</td>
</tr>
<tr>
<td>Nursing – CNMIII (level of infection control sister)</td>
<td>€50,874</td>
<td>€71,096.42</td>
</tr>
<tr>
<td><strong>Overall range:</strong></td>
<td></td>
<td><strong>€71,096 to €97,437.89</strong></td>
</tr>
</tbody>
</table>

There could be cost and quality implications to choosing which grade or profession of staff should be employed as a MSO. The decision should depend on type of reporting structure and the attributes which different staff members could bring to the post. The profession of pharmacy is most associated with the post in the published literature with organisations such as the American Society of Health-Systems Pharmacists and the Royal Pharmaceutical Society of Great Britain defining and championing the creation of such roles (The Pharmaceutical Journal 2013; Alexander et al. 2013; Burgess et al. 2010).

4.2.2 COST TO ORGANISATION OF DELIVERING CHANGES

Costs may be occurred as part of specific patient safety initiatives being undertaken. These initiatives are normally based on the recommendations of a medication safety organisation or in response to reported incidents, and would require individual appraisals. Sample costs have been included in

† Mid-point of pay scale + Employers PRSI (10.75%) + Imputed Pension Costs (4% of pay) + overheads (25% of pay) in line with Department of Public Expenditure & Reform
Table 4-2 below as an illustration.

It might be appropriate to calculate the cost benefit ratio for each of these changes individually based on the expected reduction in adverse event rate. This can be difficult for events which are considered as 'never' events, such as the direct administration of concentrated electrolytes, as any such event would be catastrophic.
TABLE 4.2: SAMPLE COSTS OF IMPLEMENTING MSO ADVICE

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Cost before initiative</th>
<th>After initiative</th>
<th>Net cost (reduction)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Replace vials of concentrated potassium with premixed infusions</td>
<td>20mmol vial of Strong Potassium Chloride will cost €0.55+ €0.89 for a 500ml bag of Sodium Chloride</td>
<td>Premixed Potassium 20mmol in a 500ml bag of Sodium Chloride 0.9% has a cost of approximately €1.20</td>
<td>Reduction of €0.22. Negligible savings (approximately €200) over one year</td>
</tr>
<tr>
<td>Use 20% solution of glucose instead of 50% solution for hyperkalaemia and hypoglycaemia</td>
<td>Glucose 50% Solution. €1,456.15</td>
<td>Glucose 20% (€6,255 annually)</td>
<td>€4,798.85</td>
</tr>
<tr>
<td>Cost of labelling high risk drugs and SALADs</td>
<td></td>
<td></td>
<td>€1893.56 spent on a full suite of labels in 2014</td>
</tr>
</tbody>
</table>

4.3 BENEFITS

4.3.1 VALUE OF POTENTIAL REDUCTION IN ADVERSE DRUG EVENTS

Studies on the incidence of medication incidents and adverse drug events have resulted in a large variation in reported prevalence. This has been attributed to multiplicity in the terminology and definitions being used (Lisby et al. 2010; Alberti 2001). Table 4.3 overleaf includes the prevalence of ADEs where available and financial impact of events listed in suitable studies and papers.

In 2011 (the latest year for which data is publically available) the national average cost for an inpatient bed day in Ireland was €825, while the national average cost for a bed day in an intensive care unit was €2426. These include all the cost associated with a patient’s care (labs blood, nursing, theatre, drugs etc.) (Casemix 2015). These figures would be considered to be appropriate for our hospital.
### TABLE 4-3: INCIDENCE AND FINANCIAL IMPACT OF PREVENTABLE ADVERSE DRUG EVENTS

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bates et al. 1997; Bates, Cullen, et al. 1995</td>
<td>US</td>
<td>ADE per admission</td>
<td>6.5%</td>
<td>+2.2</td>
<td>$2,595 per event</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Preventable ADE per admission</td>
<td>1.82%</td>
<td>+4.6</td>
<td>$4685 per event</td>
</tr>
<tr>
<td>Vincent, Neale, &amp; Woloshynowycz, 2001</td>
<td>UK</td>
<td>Preventable adverse events</td>
<td>5%</td>
<td>-</td>
<td>GB£770 Million</td>
</tr>
<tr>
<td>Classen, Pestotnik, Evans, Lloyd, &amp; Burke, 1997</td>
<td>US</td>
<td>ADE per admission</td>
<td>2.43%</td>
<td>+1.74</td>
<td>$2,013 per event</td>
</tr>
<tr>
<td>Baker et al., 2004</td>
<td>Canada</td>
<td>ADE† per admission</td>
<td>1.8%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Senst et al., 2001</td>
<td>US</td>
<td>ADE</td>
<td>4.2%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Samp, Touchette, Marinac, &amp; Kuo, 2014</td>
<td>US</td>
<td>Medication errors reported by pharmacists</td>
<td>779 errors in a 14 day period</td>
<td>-</td>
<td>$89.35 per event</td>
</tr>
<tr>
<td>Pinilla, Murillo, Carrasco, &amp; Humet, 2006</td>
<td>Spain (private)</td>
<td>Medication Error</td>
<td>Case control study (matched)</td>
<td>+6.93 (per error)</td>
<td>€1641.32</td>
</tr>
<tr>
<td>Davies et al., 2009</td>
<td>UK</td>
<td>ADRs in inpatients</td>
<td>545 in 3695 inpatient episodes (14.7%)</td>
<td>+1.71 (per ADR)</td>
<td>-</td>
</tr>
<tr>
<td>Pirmohamed et al., 2004</td>
<td>UK</td>
<td>ADRs causing admission</td>
<td>6.5% of admissions</td>
<td>8 day total stay</td>
<td>n/a</td>
</tr>
<tr>
<td>Bates et al., 2010</td>
<td>Ireland</td>
<td>Prescribing errors</td>
<td>Unclear</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kirke et al., 2007</td>
<td>Ireland</td>
<td>Reported Incidents/Near misses</td>
<td>510 in 4 hospitals (1,115 beds) over 3 months</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Kirke, 2009</td>
<td>Ireland</td>
<td>Reported Incidents/ Near Misses</td>
<td>6,179 in 8 hospitals (3,500 beds) over 6 months</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

† Overall adverse event rate of 7.5%, adjusted for 85/360 of those adverse events, giving an Adverse Drug event rate of 1.77%
Frontier Consulting, in their 2014 report to the NHS have extrapolated the 5% cost of preventable adverse events from (Vincent et al. 2001) to arrive at a cost of UK£2.5 billion per annum as the estimated cost of medication error in the United Kingdom annually. There were 29,753 patient encounters in MRHT in 2014, between inpatient admissions and day cases. Table 4-4 shows the number of adverse events which would be expected on that basis of those numbers and a range of event rates from the literature as outlined in Table 4-3 above. This would suggest a plausible range of the incidence of ADEs in a year, which has been calculated as being between approximately 500 and 2,000 events. This figure does not take into account the potential that some of the bed days prevented by actions to reduce medication risks would be ICU beds, as to extract this level of data audit figures from the hospital would be required.

**Table 4-4 Extrapolated Annual Adverse Drug Event Rates for MRHT, Based on Incidence Rates in the Literature**

<table>
<thead>
<tr>
<th>Paper:</th>
<th>Event Rate</th>
<th>ADEs in MRHT based on this rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bates et al. 1997</td>
<td>6.5%</td>
<td>1933</td>
</tr>
<tr>
<td>Vincent, Neale, &amp; Woloshynowych, 2001</td>
<td>5%</td>
<td>1488</td>
</tr>
<tr>
<td>Senst et al., 2001</td>
<td>4.2%</td>
<td>1250</td>
</tr>
<tr>
<td>Classen, Pestotnik, Evans, Lloyd, &amp; Burke, 1997</td>
<td>2.43%</td>
<td>723</td>
</tr>
<tr>
<td>Baker et al., 2004</td>
<td>1.8%</td>
<td>536</td>
</tr>
<tr>
<td><strong>Range:</strong></td>
<td>1.8 – 6.5%</td>
<td>536-1933 events</td>
</tr>
</tbody>
</table>

Costs have been calculated for an ADE in the literature. These costs have been calculated in Table 4-5 below using the range of expected ADEs for our hospital. These figures should be interpreted with caution as they have not been adjusted for medical inflation, or converted from the currency of the country in which they were calculated. They do nonetheless provide a ballpark figure for any estimation of the cost to the hospital of ADEs.

Table 4-5: Attributable costs of ADEs to MRHT based on the literature:

<table>
<thead>
<tr>
<th>Paper:</th>
<th>Financial Impact per ADE</th>
<th>536 ADEs annually</th>
<th>1933 ADEs annually</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. W. Bates et al., 1997</td>
<td>$2,595</td>
<td>US$1,390,920</td>
<td>US$5,016,135</td>
</tr>
<tr>
<td>Classen, Pestotnik, Evans, Lloyd, &amp; Burke, 1997</td>
<td>$2,013</td>
<td>US$1,078,968</td>
<td>US$3,891,129</td>
</tr>
<tr>
<td>Pinilla, Murillo, Carrasco, &amp; Humet, 2006</td>
<td>€1641.32</td>
<td>€879,747.52</td>
<td>€3,172,671.56</td>
</tr>
</tbody>
</table>

Samp, Touchette, Marinac, & Kuo, (2014) calculated the cost of each reported medication error at $89.35 per reported event. If all incidents were being reported and
collated by an MSO it might be possible to extrapolate a cost for the hospital. Similarly, Pinilla, Murillo, Carrasco, & Humet (2006) estimated a greater impact on length of stay, of an average (mean) additional 6.93 days, for approximately 75% of reported medication errors which reached the patient (categories C-I of the NCC MERP algorithm from National Coordinating Committee of the Medication Error Reporting Service).

The impact of an ADE on length of stay has been established in some of the studies covered in Table 4-3 above. As the average cost of a bed day in an Irish Hospital has been established, it can be possible to estimate the cost of additional bed days for a range of expected incidences of ADEs, as calculated in. In Table 4-6 below, a range of costs has been established, based on each bed day in an Irish hospital costing an average of €825 (Casemix Unit 2015).

**TABLE 4-6: RANGE OF COSTS OF ADDITIONAL LENGTH OF STAY, BASED ON AVERAGE COST OF A BED DAY IN AN IRISH HOSPITAL**

<table>
<thead>
<tr>
<th>Paper:</th>
<th>Impact on Length of Stay</th>
<th>536 ADEs at €825 per bed day</th>
<th>1933 ADEs at €825 per bed day</th>
</tr>
</thead>
<tbody>
<tr>
<td>D. W. Bates et al., 1997 and Bates 1995</td>
<td>+2.2</td>
<td>€972,840</td>
<td>€3,508,395</td>
</tr>
<tr>
<td>Classen, Pestotnik, Evans, Lloyd, &amp; Burke, 1997</td>
<td>+1.74</td>
<td>€769,428</td>
<td>€2,774,822</td>
</tr>
</tbody>
</table>

Bates et al. (1997) estimated that 28% of ADEs are preventable. These preventable ADEs have a greater impact on length of stay with an average of an additional 4.6 days. Costing these days at the average rate for an Irish hospital, an expected 150 preventable ADEs would cost the study hospital €569,250 annually, and, if the higher rate of 5% was experienced, an extrapolated 541 pADEs would cost €2,053,095.

Overall, extrapolating the data from international studies to the patient numbers treated at the study hospital suggests that the annual cost of preventable adverse drug events is in the range of €879,747.52 to €2,774,822 if calculated on the basis of effect on length of stay. If 28% of those ADEs are preventable (Bates, Boyle, et al. 1995) the value of savings which could be achieved would be €246,329.31 to €776,950.16.

**4.3.2 OTHER POTENTIAL SAVINGS**

The IHI trigger tool, as adjusted for the UK (Institute for Healthcare Improvement & NHS Institute for Innovation & Improvement 2008) includes some modules which allow for the estimation of adverse event rates from the quantity of different antidotes dispensed by the pharmacy department. Estimated the value of these items which have been dispensed could give a conservative estimation of some direct costs which
could be saved, specifically by the pharmacy department, should risk reduction measures be introduced.

**TABLE 4-7: SPENDING ON ANTIDOTES IN MRHT, CALENDAR YEAR 2014**

<table>
<thead>
<tr>
<th>IHI Trigger Code:</th>
<th>Antidote Used:</th>
<th>Quantity</th>
<th>Cost (including VAT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T2</td>
<td>Vitamin K</td>
<td>840</td>
<td>€645.73</td>
</tr>
<tr>
<td>T3</td>
<td>Flumazenil</td>
<td>535</td>
<td>€9,373.20</td>
</tr>
<tr>
<td>T5</td>
<td>Naloxone</td>
<td>135</td>
<td>€1,119.35</td>
</tr>
<tr>
<td>Glucagon</td>
<td>51</td>
<td></td>
<td>€1,407.65</td>
</tr>
<tr>
<td>Glucose 50%</td>
<td>61</td>
<td></td>
<td>€188.99</td>
</tr>
<tr>
<td>Glucose 20%</td>
<td>470</td>
<td></td>
<td>€6,255.03</td>
</tr>
</tbody>
</table>

**Total spent on antidotes:** €18,989.95

It should be noted that this total cannot be added to the total achievable savings identified in section 4.3.1, above, as the purchase cost of medication would be included in any estimate of the treatment cost for a patient, and would constitute double counting of benefits.

### 4.4 BENEFIT TO COST RATIO OF A MEDICATION SAFETY OFFICER

A cost benefit analysis or financial appraisal requires that all the costs and benefits of proposal are identified and quantified. A metric such as the Benefit Cost Ratio can be used to establish if the project is worth carrying out (Central Expenditure Evaluation Unit 2012b). The advantage of this method is its simplicity. However, care should be taken when interpreting the ratio, as the total sum of cost savings, as well as the discounted value of a projects where costs and benefits occur in different financial periods, might be necessary for comparison between projects (Central Expenditure Evaluation Unit 2013).

Bringing the data together for costs from 4.2 and potential benefits identified in 4.3 above we can estimate that benefits of €246,329.31 to €776,950.16 can accrue from spending of at a cost of €71,096 to €97,437.89. This would represent a benefit to cost ratio of between 2.5 and 10.93:1, which would represent value for money to the institution.

### 4.5 SENSITIVITY ANALYSIS

Based on the data above, the range of pADEs for the hospital has been estimated. The proportion of these ADEs which could be prevented by having an MSO in has not been established. It could be assumed that it would be possible that having an MSO in position would mitigate all or none of these adverse events.
The costs of employing an MSO are based on the midpoint of nationally agreed salary scales (Central Expenditure Evaluation Unit 2012a). These would vary from €65,703.46 to €110,489.15 (adjusted to include all costs) depending on the point on the salary scale to which the MSO was appointed. Additionally, these salaries are subject to adjustment upwards. Table 4-8 shows the effect of salaries on the cost-effectiveness of the post. It also demonstrates how an increase in salary costs of 5% and different assumptions around the level of pADE mitigation that might be achieved would affect the benefit/cost ratio of the result.

An election is imminent in Ireland during 2015/16 and some recent salary adjustments such as those in the Fiscal Emergency Measures in the Public Interest Acts (Statutory Instrument of the Government of Ireland 2013) may be reversed. A scenario has been calculated based on the highest point of the Chief II Pharmacist salary scale, should this take place.

**TABLE 4-8: SENSITIVITY ANALYSIS OF COSTS AND BENEFITS**

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Benefit</th>
<th>Cost</th>
<th>Benefit/Cost Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current costs and salaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midway point of expected range of preventable adverse events and salary.</td>
<td>€511,639.74</td>
<td>€84,266.96</td>
<td>6.07:1</td>
</tr>
<tr>
<td>Nursing CNMIII at first point in salary scale with a complete reduction in pADEs at a 6.5% incidence</td>
<td>€776,950.16</td>
<td>€65,703.46</td>
<td>11.83:1</td>
</tr>
<tr>
<td>Chief II Pharmacist MSO at highest point on salary scale with a 50% reduction in pADEs at a 1.8% incidence</td>
<td>€123,164.66</td>
<td>€110,489.15</td>
<td>1.15:1</td>
</tr>
<tr>
<td>5% increase in salaries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Midway point of expected range of preventable adverse events and salary.</td>
<td>€511,639</td>
<td>€88,480.29</td>
<td>5.78:1</td>
</tr>
<tr>
<td>Nursing CNMIII at first point in salary scale with a complete reduction in pADEs at a 6.5% incidence</td>
<td>€776,950.16</td>
<td>€68,988.63</td>
<td>11.26:1</td>
</tr>
<tr>
<td>Chief II Pharmacist MSO at highest point on salary scale with a 50% reduction in pADEs at a 1.8% incidence</td>
<td>€123,164.66</td>
<td>€116,013.61</td>
<td>1.06:1</td>
</tr>
<tr>
<td>Chief II Pharmacist MSO at highest point on salary scale, full reversal of all FEMPI cuts, with a 50% reduction in pADEs at a 1.8% incidence</td>
<td>€123,64.66</td>
<td>€126,183.07</td>
<td>0.98:1</td>
</tr>
</tbody>
</table>

* Taking the midpoint between the median total salary cost of a Chief II Pharmacist (€97,437) and administration grade VII (€73,108.82)
The post would continue to be cost-effective at all levels above the final scenario at the upper end of the salary scale. A further “worst case” scenario could have been considered, given that it could be possible to put an MSO in place, but achieve no reduction in pADEs. The assumptions in the above table are also subject to interpretation, and further investigation, as the grade of person employed could affect the outcome in terms of the number of pADEs avoided.
5 DISCUSSION

This study aimed to look at the work of a medication safety officer (MSO) in order to evaluate whether the potential financial benefits to this hospital would outweigh the costs of creating the role, and as a result to identify whether it would be worthwhile to create medication safety pharmacist posts in an Irish Model 3 hospital. Reducing harm from medication errors and preventable adverse drug events should provide a financial benefit in addition to improving the care of patients (Saine 2010a; Seng Wu 2010; Saine 2010b).

A range of benefit to cost ratios, from 2.5 to 10.9: 1 was established, identifying that employing an MSO is indeed a cost-effective approach to improving medication safety in a hospital such as this one. The potential savings would be in the region of €150,000 to €700,000 depending on the baseline of medication safety issues, and the grade of staff chosen.

The results have shown no causal link between the employment of a medication safety officer and a reduction in adverse events. However, it is plausible to claim that any realistic attempt to measure and investigate adverse drug events and errors, and to put measures in place to reduce them will improve awareness and support a medication safety culture which should reduce risks and adverse events significantly. In addition to this there would be significant social and economic benefits from improving the patient safety culture which have not been considered directly in this study.

Prevalance data in an Irish public hospital setting was estimated using the approach taken by Frontier (2014) in their report to the National Health Services in the UK. Prevalance data from the literature was extrapolated to local patient numbers to arrive at the results above.

5.1 COST-BENEFIT OF MEDICATION SAFETY OFFICERS

On the basis that preventable adverse drug events (pADEs) cost our hospital in the range of €246,329 to €776,950 and the costs of employing a medication safety officer (MSO) to reduce such events would be between €71,096 to €97,437.89, such an initiative would have a significant net financial benefit for the hospital. Any reasonable reduction in these events would outweigh the costs.

It has been argued that there is a benefit to following best practices even if these practices have not proven to be financially cost effective. This benefit is confounded by
the economic realities and the personal costs to healthcare staff and patients when poor quality outcomes take place. Benefits can also be less clear cut when those benefits are of an indirect or softer type, and when they occur in the longer term future, requiring the need for discounting to take place as part of cost benefit appraisals, and resulting in a quantification of benefits which in advance can be no better than estimates.

There is a compelling need for quality improvement roles to be measured so that it can be proven that they are economically and financially viable (Donaldson 2011) and for . In healthcare systems experiencing financial scarcity, for commercial or policy reasons, using resources which might otherwise be committed to other patient care services, with proven benefit, must be justifiable.

Employing an MSO in a hospital would be likely to increase the reporting of medication safety incidents and the detection of adverse drug events by audit and investigation, as a direct result of the requirements of the job description, versions of which have been reproduced in Appendix II. Introducing changes in response to this increased detection of ADEs would have a financial cost at the time of implementation, but should provide a return on investment with time.

5.2 THE ECONOMIC AND SOCIAL CASE FOR MEDICATION SAFETY OFFICERS

The case for MSOs might be more compelling if viewed from an economic or social perspective than from a strictly financial on. The burden of the cost of medication errors and adverse drug effects is felt by individual patients and families; given that one life saved is an excellent outcome for that one group of family and friends. To a bereaved relative, the knowledge that an adverse event was extremely rare is no consolation, given that the incidence in their frame of reference was 1 in 1 (Alberti 2001).

Leatherman et al., (2003, p. 27) discuss the concept of “Adverse Selection,” where a hospital implements an improvement in quality, particularly in the care of a costly or chronic disease which is made public. This can then lead to the selective enrolment of costlier patients without concomitant increases in reimbursement, or in an Irish setting with no adjustment to the budget, leading to additional cost to the hospital. There is no empirical data on this phenomenon in Irish hospitals, but if there were, there would be a risk that a hospital with a reduced ADE rate because of the presence of an MSO might admit more patients who were concerned about such risks.
Leaders in the patient safety movement have established that preventing avoidable events which cause patient harm requires more than changing systems and implementing best practices. A change is needed in the mindset of staff regarding safety along with a change in the underlying culture in which healthcare is provided and monitored (Smetzer 2007; Meyer et al. 2010). This culture can be developed if the organisation shows leadership by appointing staff, such as MSOs to drive activities in quality.

5.3 OPPORTUNITY COST: OTHER COST-EFFECTIVE ACTIONS THAT COULD IMPROVE MEDICATION SAFETY

A key reason why the cost-benefit of an initiative such as appointing an MSO should be appraised is that the cost of funding the post could otherwise be spent on other initiatives which could deliver improved patient care at a lower cost (Meltzer 2012). Examples of one possible alternate use of funds would be on clinical or other pharmacist staffing, as identified by Bond & Raehl, (2007) who identified that a core set of pharmacist activities were associated with reduced mortality and other favourable outcomes including reduced costs of care or drug costs, lengths of stay, medication errors and adverse drug reactions. These activities were participation on cardio-pulmonary rescue teams, in-service education, drug information, medical round participation, drug protocol management and admission drug histories, along with the management of ADRs. Overall pharmacy staffing, in particular where that staffing has been decentralised from the pharmacy department is favourably associated with health care outcomes and reduced costs.(Bond et al. 2004) More recently, Gallagher, McCarthy, & Byrne (2014) have shown that clinical pharmacists provide cost savings, but that the number of studies proving this has reduced in recent years.

No discussion on reducing the risks in medication management is complete without consideration of the potential role of information technology in the prescribing and administration process. Adoption of Computerised Physician Order Entry (CPOE) with decision support (Ammenwerth et al. 2008), barcode medication administration (BCMA) and automated dispensing cabinets as well as a number of other technological approached have been suggested as methods by which medication errors and adverse drug events can be reduced (Committee on identifying and preventing medication errors et al. 2007, p.6). These technologies should not be considered as a panacea, but can be useful tools when appropriately used as part of a hospital wide patient safety strategy. While it would be possible to implement some, or all of the above in the absence of an MSO, such interventions would benefit from a medication safety officer on site to drive changes.
Economically, safer medication use would benefit from incentivisation of hospitals and prescribers through payment mechanisms. At present in the Irish system there is no incentive to hospital to reduce long term risks or patient safety on discharge, as the casemix system does not differentiate between diagnostic related groups (DRGs) which may have arisen due to error or oversight. Additionally, reducing the number of private patient bed days or the requirement for additional monitoring, by reducing adverse drug events might cost the hospital and its consultants, by reducing billable items.

### 5.4 Medication Safety Officers and Cultural Change

Culture change is a key component of improving patient safety, but this change has been slow to materialise even in light of the landmark reports produced at the turn of the century (Leape & Berwick 2005; Donaldson 2008). However, one factor which appears to be associate with the implementation of medication safety measures is the interest which health care providers have in seeking accreditation, in particular from quasi-regulatory organisations such as Joint Commission International (Devers et al. 2004). Regulation and inspection of hospitals in Ireland will take place under the auspices of the Health Information and Quality Authority (Higgins 2013, para.2.2.8) and this may have an impact on patient safety efforts, including the employment of MSOs. Additionally, it is interesting to note that the UK regulator now requires institutions to employ an MSO (MHRA & NHS England 2014a).

Much of the literature links patient safety culture to reducing medication errors and adverse events (McCarthy & Blumenthal 2006) and the national and international approach (MHRA & NHS England 2014a; Committee on identifying and preventing medication errors et al. 2007; Maddeden 2008) appears to be based around changing the culture around healthcare. I believe that this change in culture can be achieved by requiring that one individual be tasked with driving change in a particular area, and by giving that individual responsibility and power within the organisation to achieve such change. With an MSO in place it could be expected that it would be more likely that IMSN, ISMP and NHS guidelines and advice would be implemented. Networking with such organisations and implementing their guidance has been written in to the job description of the MSO in some institutions (see Appendix II below).

Putting a financial value on medication safety helps to contextualise the financial benefit to the hospital and to the individual staff, particularly in an atmosphere where high volumes are demanded despite pressures of low staff to patient ratios. The staff nurse who can complete a drug distribution round in the shortest time is likely to be
valued more than a similar nurse who fulfils all the patient safety requirements to the letter of the law. This may encourage ‘at risk behaviour’ which can run counter to medication safety (Smetzer 2007).

Reason (2000) discusses the ‘person approach’ to human error, which focuses on the unsafe acts, such as errors and procedural violations, of healthcare staff on the frontline. Counter measures are directed towards reducing variability in human behaviour, and include instilling a sense of fear, additional procedures, naming, blaming & shaming, disciplinary measures in a way that treat problems as moral issues. This approach has serious shortcomings and is unsuited to medicine, and is likely to thwart the development of safer healthcare institutions. A systems based approach would be more effective, as a way of adding barriers and safeguards to the system and reducing error traps in the workplace. He compares the two approaches, with the person approach as being similar to swatting mosquitos individually, and initiatives such as employing an MSO as akin to draining the swamp in which the mosquitos breed. The systems approach relies on a reporting culture so that when an adverse event occurs an assessment is made as to why defences failed.

The analogy of draining the swamp also contributes to the debate on how it might be difficult to allocate cost savings to the role of an MSO. Taken at a micro level, the purchase of multiple swatters for dealing with individual mosquitos may appear to be a cheaper option, while a task as large as draining a swamp may sound prohibitively expensive to a cash starved organisation. The costs of a macro-level project of this type may need an economic evaluation to identify the costs and benefits to the state.

It would be a worthwhile study to identify whether structures such as medication safety committees or medication safety officers contribute to a patient safety culture in a hospital.

5.5 DIFFICULTIES IN IDENTIFYING BENEFITS

The cost of a medication incident or ADE in Ireland has not been calculated. Within our hospital, the incidence of these events has not been identified, and as a result estimation was made based in data from British, Spanish and American studies. The Irish healthcare system is a mixture of private fee for service healthcare and public funded healthcare (McDaid et al. 2009, p.19), for which the data from predominantly fee for service systems (USA) or services paid for directly by the state (UK) might not be directly comparable. The education of healthcare staff within our hospital, in particular to consultant level, involves training in the UK and USA, and systems of
healthcare provision are heavily influenced by these systems despite the difference in incentives offered within the systems. It could be argued that due to the increased complexity and two tier nature of the Irish system that the expected level of medication error could in fact be higher. On the other hand, the fact that patients in the publically funded cohort of patients in Ireland are likely to spend more time in individual institutions and experience less transition between care institutions than their American Medicare equivalents, and so might be likely to be exposed to a lower level of ADEs.

There is a lack of data on the prevalence of medication incidents and adverse drug events in the Irish healthcare system. This suggests a need for organisations to start measuring these in a robust and accurate way. Organisations could then benchmark themselves against standard or baseline so as to demonstrate improvement and evaluate if value for money is being achieved. While reporting of incidents and near misses takes place and some attempts have been made to collate such data nationally, only data on events where harm has been caused are escalated to the national reporting system. The few existing references in the Irish system quote medication incidents reported, without a valid denominator, although one can be estimated based on the bed numbers and activities in the associated hospitals.

This lack of measurement is possibly an international problem given that a MEDLINE search found that less than 1 in 100 articles identified contained quality improvement processes included information which could be used to calculate a return on investment (Kilpatrick et al. 2005). Clinically, given the compelling evidence from landmark reports and investigations nationally and internationally such as Maddden (2008); Francis (2013); The Audit Commission (2001); and Kohn et al. (2000) the case could be seen to be compelling, but with changes and differences in healthcare systems and challenges with new drugs and new classes of drugs being introduced as well as the impact of austerity measures on staffing numbers it would be appropriate to have up to date measures of the incidence of such events.

It would also be appropriate where measures have been introduced, such as the introduction of MSOs that some key performance indicators be measured. These measurements would be most effective if there were national comparators against which performance could be measured, subject to appropriate adjustment for complexity and case-mix.

The are no clear empirical data for the improvement in care which could be expected by employing an MSO. This might require the design of a controlled trial of services in the absence and presence of such a post. Confounding factors would have to be taken
into account, given that randomisation of patients between settings including an MSO service and those without would not be practical. A statistically significant reduction in mortality was found by Bond & Raehl, (2007) suggesting that pharmacist should be involved in adverse drug reaction monitoring as part of their core duties. Managing such monitoring would be a key part of the role of an MSO.

Many hospitals and individual health professionals in Ireland are already working to maximise patient safety without a specifically named MSO being in place. Data from the Irish Medication Safety Network shows frequent reference to the documents on their website from within the Irish Healthcare system and beyond (Kirke & Irish Medication Safety Network 2015).

Additionally, hospitals employing MSOs might have delayed take-up of medication safety initiatives for other locally established reasons. It would be appropriate to survey hospitals for implementation of IMSN, ISMP, and NHS NPSA initiatives to see whether presence or absence of an MSO would have an effect on this output, but this would be no benefit in identifying whether or not the number of medication safety incidents or ADEs would be reduced.

Data on ADEs within a hospital can be achieved by incident reporting, pharmacist surveillance, local real-time review of medical records (Olsen et al. 2007) or by using a “trigger tool” such as that developed by the IHI (Griffin & Resar 2009). Incident reporting and pharmacist surveillance have the disadvantage that it may not be possible to identify the overall incidence of events within a hospital as individual reports will not necessarily come from a representative sample of patient admissions. A trigger tool audit or a record review can give information on ADE prevalence, if carried out robustly. The trigger tool has previously been successfully used in an Irish hospital to identify and quantify adverse event rates on hospital admission (Breslin 2007) and can also be used to identify appropriate prevalence rates for ADEs for inpatients.

The clear need for improvement identified in late 1990s in the USA by reports such as To Err is Human (Kohn et al. 2000) drawing on the work of Bates et al., (1997); Bates, Cullen, & Laird, (1995) and Classen, Pestotnik, Evans, Lloyd, & Burke, (1997) meant that large scale studies identifying the problem have not taken place frequently since. Landmark reports such as Maddden, (2008) in Ireland and Francis (2013) in the UK have meant that there is a compelling case to take action on the causes of iatrogenic disease without specific knowledge of the level of the problems.

Using reported medication incidents as a marker may be confounded by the fact that with an increased focus on safety and safety culture there can be an increase in the
reporting of medication safety incidents, while at the same time there might in fact be a reduction in the occurrence of those incidents.

### 5.6 OTHER LIMITATIONS AND ASSUMPTIONS

The ADE rates used in this study have been derived from international data and may not be applicable in Ireland for a number of reasons. The ratio of pharmacists to patients in hospitals differs internationally, and in particular between Irish and US hospitals with far less clinical pharmacy staff in Irish hospitals (Frontini et al. 2013). Additionally, this hospital has a mix of insurance or privately funded patients (14.6% of patients in 2014) with directly state funded patients (Gorman 2015). The data from the US would represent predominantly private patients and that from England and Scotland, mostly public patients. The difference in safety or quality between public and private patients has not been investigated, and would be confounded by other variables.

Because the analysis of organisational costs associated with errors is complex, and the direct costs of additional care and indirect costs of lost income, increased disability and increased burden falls on victims of iatrogenic disease fall on the patient rather than the institution (Weeks 2001) the full economic and social cost of adverse drug events is difficult to quantify. This study concentrated on the financial costs to the hospital, and is likely to underestimate the overall benefit that would accrue if a medication safety officer were to reduce overall medication errors and adverse events.

The costs assessed based on data for 2011, which was the most recent available data in Ireland and were not adjusted for medical inflation. However, at the same time there has not been any wage inflation. This has been discussed further as part of the sensitivity analysis.

An assumption has been made that the benefits and costs of employing an MSO occur in the same financial year, and as a result discounting of costs and benefits was not carried out. It might be appropriate to consider costs and benefits over a ten year term, but in this case the ratio of those parameters were assumed to remain relatively constant. The issue of medical and wage inflation has been covered in chapter 4 under the heading of sensitivity analysis.

There are differences in staffing levels and pharmacy department structures across the Irish system with some services being more focused on medication safety during the inpatient stay, while others focus on the care of patients at transitions of care. At
present an attempt to standardise structures within hospital pharmacy is taking place (Dept of Health et al. 2011) which might affect this variability.

Other questions exist which have not been covered by this study. The most effective grade of staff who could act as a medication safety officer has not been established, although pharmacists are the most involved in the medication management process, and represent the majority of medication safety officers employed in Ireland thus far. The grade of pharmacist that could be employed in different models of hospitals and number of whole time equivalents that would be appropriate for the work involved could be elucidated. How and where an MSO could fit into the current structure of a hospital, and whether in a high performing organisation that structure might need to be change is also an appropriate question. The effectiveness of an MSO could be very much enhanced by the existence of a quality structure and culture within and organisation, and it would be highly doubtful that such an officer could create a medication safety culture without the support of senior stakeholders within the organisation, such as the management team and consultants. As a clinical pharmacist, an MSO’s skills could be maintained by working at the front line, but the level and quantity of such routine work that they should be completing might need evaluation. The question would also arise as to whether they should be involved in the day to day work of procurement and dispensing. These issues also affect the costing of the MSO role. If a medication safety pharmacist was spending 30% of their time providing services other than those of an MSO, it would be appropriate to reduce the costs attributable to the post by 30%, as the value being provided during the time spent on direct clinical pharmacy (or other) services would be attributable to those actions.

Benefits were calculated on the basis of reducing the number of adverse events which caused increased length of stay for patients. However, this assumes that none of the adverse drug events caused immediate death, which would not incur such costs. From a strict financial point of view, an intervention which avoided a potential death might in fact increase costs to the organisation, although the wider economic benefit-cost ratio would be positive (Alves de Rezende et al. 2012).

5.7 CONCLUSION

Having a medication safety officer could be a part of a patient focused quality culture which a hospital might wish to portray. This could have reputational benefit for the hospital, and assist the hospital in achieving the standards required for registration. Without such a culture in place there can be difficulty in retaining motivated and safety focussed staff. Implementing safety systems can result in benefits such as increased
satisfaction of healthcare workers. People do not want to be part of poorly delivered care, and when systematic features of our care systems are deficient, problems are likely to occur in such service delivery (Kinninger & Reeder 2003). The concept of a high reliability organisation in healthcare includes building a system with formal structures, procedures and incentives, which also includes a system of communication which should be informal (Carroll & Rudolph 2006). A medication safety officer, as a confidential recipient of safety reports supports this aim.

As the extent to which an MSO would reduce ADEs has not been empirically established, it would be appropriate to employ such an officer, but to expect that they would measure outcomes from the improvement processes carried out which would show the return on investment from each improvement. Such an officer could also use the tools identified in this study to identify the most appropriate improvements that could be made based on an expected return on investment. Tools, such as the IHI adverse events improvement calculator (Institute for Healthcare Improvement n.d.) were considered for use in this study, but might more appropriately be used by an MSO to track improvements in medication safety within their hospital after specific risk reduction measures have been implemented.

The costs to society of lost years of productivity by victims of ADEs might also be calculated and established tools exist to calculate such costs. Additionally, the cost to the Irish state of litigation, costed by the state claims agency at €135 million annually could also be considered. Based on bed numbers this could be estimated at about €3 million per annum for a hospital such as Midland Regional Hospital at Tullamore. In fact, some analysts suggest that this figure is an underestimate (McDowell 2013; Kelly 2010) and also misses a large number of claims for injuries which fall outside statutes of limitation, or are simply not contested.

Overall, from strict financial viewpoint, appointing a medication safety officer would benefit a hospital. If considered, the social and economic benefits would strengthen this case. It would be appropriate to calculate baseline adverse event rates, to appraise quality improvement initiatives individually, and in advance of implementation, and to measure outcomes of such improvements from a financial point of view. A more compelling case from the organisations perspective might then be drawn up.


Casemix Unit, 2015. [e-mail] Costs of patient bed day. , p.1.


Cullen, P., 2013. Cost of medical accidents “up to €350m a year.” *The Irish Times*.


Francis, R., 2013. Report of the Mid Staffordshire NHS Foundation Trust Public Inquiry,

Frontier, 2014. Exploring the costs of unsafe care in the NHS,


Gorman, M., 2015. [E-mail] Patient Numbers.


Health Service Executive, 2015. Acute Hospitals Service Plan 2015,

Health Service Executive, 2013a. Annual Report and Financial Statements 2013,


Health Services Executive, Annual Leave. Available at: http://www.hse.ie/eng/staff/Benefits_Services/Timeoff/Annual_Leave.html [Accessed April 15, 2015].


Institute for Safe Medication Practices, About ISMP. Website. Available at: https://ismp.org/about/default.asp.


International Conference on Harmonisation of Technical Requirements for registration of pharmaceuticals for human use, 1994. Clinical Safety Data Management: Definition and standards for expedited reporting,


ISMP Canada, Definitions of Terms. ISMP Canada Website. Available at: https://www.ismp-canada.org/definitions.htm [Accessed April 18, 2015].


Kohn, L.T. et al., 2000. To Err is Human: Building a Safer Health System,


Olsen, S. et al., 2007. Hospital staff should use more than one method to detect adverse events and potential adverse events: incident reporting, pharmacist surveillance and local real-time record review may all have a place. *Quality & safety in health care*, 16, pp.40–44.


Appendix I  GLOSSARY OF TERMS USED IN MEDICATION SAFETY

ERROR

The term “error” includes something incorrectly done through ignorance or inadvertence; a mistake (in calculation, judgement, speech, writing, action) or a failure to complete a planned action as intended or the use of an incorrect plan of action to achieve a given aim (Aronson 2009).

MEDICATION ERROR

A medication error is any preventable event that may cause or lead to inappropriate medication use or patient harm while the medication is in the control of the health care professional, patient, or consumer. Such events may be related to professional practice, health care products, procedures, and systems, including prescribing, order communication, product labelling, packaging, and nomenclature, compounding, dispensing, distribution, administration, education, monitoring, and use (NCC MERP 2000).

MEDICATION INCIDENT

A mistake with medicine, or a problem that could cause a mistake with medicine. Some sources choose to use the term medication incident as being synonymous with medication error, as defined by NCC MERP above (ISMP Canada n.d.).

NEAR MISS

An event which could have resulted in unwanted consequences, but did not, either by chance or through timely intervention the event did not reach the patient. Also sometimes known as “near hit” or a “good catch” (ISMP Canada n.d.).

ADVERSE DRUG REACTION (ADR)

All noxious and unintended responses to a medicinal product related to any dose should be considered adverse drug reactions (International Conference on...
ADVERSE DRUG EVENT (ADE)

Any untoward medical occurrence that may present during treatment with a pharmaceutical product but which does not necessarily have a causal relationship with this treatment. (International Conference on Harmonisation of Technical Requirements for registration of pharmaceuticals for human use 1994)

Or

An injury from a medicine of lack of an intended medicine. Includes adverse drug reactions and harm from medication incidents or errors (ISMP Canada n.d.).

PREVENTABLE ADVERSE DRUG EVENT (pADE)

An adverse event which could have been prevented, for example a coma due to an overdose of a sedative (ISMP Canada n.d. quoting Gandhi et al. 2000)

POTENTIAL ADVERSE DRUG EVENT

Events in which an error did occur but did not cause injury, for example, if an error was detected before the patient was affected, or if the patient received the incorrect dose but experienced no harm (Gandhi et al. 2000).

VARIANCE

Any deviation from the intent of the prescribing, dispensing or administration of a medication, including:

- Wrong medication
- Wrong dose of medication
- Wrong time
- Wrong route
- Wrong formulation
- Omitted medication
- Documentation (Medicines Prescription and Administration Record not signed or initialled)
  (Florida State Hospital 2010)

Each dose of a particular medication involved in a medication incident (or error) counts as one variance (Bayview Centre for Mental Health 2007).
Appendix II  JOB DESCRIPTIONS OF MEDICATION SAFETY OFFICERS IN IRISH HOSPITALS

Job descriptions collated by the (American Society of Health-System Pharmacists 2015) are available from http://www.webcitation.org/6XiJqzeU2

JOB DESCRIPTION 1

CHIEF II PHARMACIST
MEDICATION SAFETY OFFICER
JOB DESCRIPTION

As part of their governance framework in quality and safety organisations are to prioritise the implementation of formal reconciliation systems, to provide regular tracking audits and deployment of adequate resources in this area.

The report recommends national analysis of the problems surrounding unlicensed medicines

The licensing requirements of the Irish Medicine Board (IMB) to include risk assessment of products in use

Problems identified nationally with products should be monitored, collated and result in rapid changes.”

It is part of the Hospital Risk Management Strategy to adapt the recommendations of the Patient Safety Commission and to develop a cohesive medication safety programme.

Grade: Chief II Grade, Pharmacist

Reporting Relationships

- Report to the Chair of Clinical Governance and the Drugs and Therapeutic Committee
- Report to the Chief Pharmacist on all day to day matters
- Prepare quarterly reports for the Head of Quality and Safety on all Risk Management related issues
- Accountable to the Chief Pharmacist on all Pharmacy related Risk Management issues.

General Duties (Job Purpose)

The Medication Safety Officer will:

- Maintain throughout the Hospital an awareness of the primacy of the patient in relation to all hospital activities.
- Work to ensure optimal patient outcomes from drug therapy by managing risk in the medication management process and making recommendations for process improvements designed to prevent or minimize error.
- Participate in policy formation and development of the medication management and risk management processes in the hospital.
- Participate in continuing education and research activities consistent with the post.

Specific Responsibility
These responsibilities are subject to review by the Chair of Clinical Governance, the Head of Quality and Safety and the Chief Pharmacist from time to time.

**Principal Functions:**

**Policy Development**

- Co-ordinate processes to evaluate and improve medication management through pharmacy, nursing and medical staff through:
  - Development of policies for reporting medication errors which are systems based and non-punitive.
  - Working with the Drugs and Therapeutics Committee, Risk Management and Quality departments to ensure policies are implemented and monitor implementation of changes in practises.
  - Liaise with nursing, pharmacy and medical staff to ensure safe, standardised medication management practises.
  - Collaborate in the development of other relevant policies through identification and/or revision with nursing, pharmacy and medical staff.

**Education**

- Design and implement educational presentations to facilitate the attainment and maintenance of safe medication practices within the hospital.

**Risk Management**

- Promptly investigate medication safety incidents in order to improve staff performance and patient care, in accordance with the system-based non-punitive Policy for Reporting Medication Safety Incidents. Errors with a low severity may be investigated based on aggregate analysis. Use appropriate techniques for analysis of error causation.
  - Serve as a resource person by consulting with nursing, pharmacy and medical leadership concerning professional and education problems related to medication safety.
  - In accordance with hospital policy utilise a project management method to achieve objectives.
  - Co-Ordinate and track projects and initiatives with the hospital related to medication safety and reduction of medication errors.

**Data Analysis and Reports**

- Project management to ensure timely completion of reports, identifying data sources and collecting data for established medication safety quality measures, assisting with data analysis, documenting and tracking specifications and facilitating meetings.
  - Assist in development of data collection tools (e.g. surveys, chart abstraction forms) and manage data collection related to these tools for medication safety projects.
  - Gather data from internal and external (local, national and international) data sources to establish benchmarks and gather information on lessons learned from other medication safety initiatives that can be applied to our hospital.
  - Prepare and present reports for the regular meetings of the Drugs and Therapeutics Committee.
  - Prepare and present reports on formal investigations of serious medication incidents for the Drugs and Therapeutics Committee and the Integrated Quality and Safety Committee (IQS). Incidents graded to G and I in the NCC MERP Categorisation System must be investigated and reported to IQS and the Clinical Governance Committee.
  - Be a member of the Clinical Governance Committee.
• Promote the continuing development of a system-based, blame resistant approach to medication error reporting.

Personal Attributes

In order to function effectively within the sometimes ambiguous environment and emerging roles, the post holder must have a high level of diplomacy and interpersonal skills. Interfacing with clinicians, senior management and other staff requires substantial flexibility. The person must have strong quantitative skills and disciplined task management capabilities.

Health and Safety

Safety procedures are in place to comply with the most recent legislation and with the spirit of the hospital’s mission, vision and values. Comply with these procedures and be proactive in suggesting modifications to bring about improvement.

Confidentiality

In the course of your employment you will have access to or hear information concerning the medical or personnel affairs of patients and/or staff or other health services business. Such records and information are strictly confidential and must not be discussed or divulged except where necessary for the performance of normal duties. In addition, records must never be left in such a manner that unauthorised persons can gain access to them. Records must be kept in safe custody when no longer required.

NOTE:

The extent and speed of change in the delivery of health care is such that adaptability is essential at this level. The incumbent will be required to maintain, enhance and develop their professional knowledge, skills and aptitudes necessary to respond to a changing situation. The hospital is at the development stage therefore, the job description must be regarded as an outline of the major areas of accountability at the present time, which will be reviewed and assessed on an on-going basis.
JOB DESCRIPTION 2

HOSPITAL XXX
DRUG SAFETY CO-ORDINATOR

Qualifications:

The successful applicant should:

- Have a recognised qualification in Pharmacy, Medicine, Nursing and/or Risk Management.
- Have not less than three years satisfactory post-qualification experience including participation in the medication management process in an acute hospital in-patient setting.
- Possess the requisite knowledge and ability (including a high standard of suitability) for the proper discharge of the duties of the office.

The following are desirable:

- Experience in collecting, managing and analysing healthcare-related data.
- Experience in utilising data for continuous quality improvement.
- Excellent computer literacy with experience in word processing, spreadsheet, database and graphics programmes (Word, Excel, Access).
- Excellent report writing and inter-personal skills.

PERSONAL ATTRIBUTES:

You will:

- have strong leadership and diplomatic skills, promoting the continuing development of a system-based, blame-resistant approach to medication error management and prevention.
- have good analytical and presentation skills.

2. Age

A candidate must be under 65 years of age on the 1st day of the month in which the latest date for receiving completed application forms for the office occurs.

3. A candidate for and any person holding the office must be free from any defect or disease which would render him/her unsuitable to hold office and be in a state of health as would indicate a reasonable prospect of ability to render regular and efficient service.

4. Be of good character.

5. Arrangements have been introduced, on a national level, for the provision of Garda clearance in respect of candidates for employment in areas of the Health service, where it is envisaged that potential employees would have substantial access to children or vulnerable individuals.

Particulars of Office

The appointment is fixed term for a period of one year.

Remuneration:
Remuneration will be in accordance with the salary scale approved by the Department of Health, commensurate with experience and professional qualifications.

Superannuation:

The terms of the Voluntary Hospitals Superannuation Scheme and the Voluntary Hospitals Spouses and Children’s Scheme will apply to position. Contributions are at the rate of 5% and 1.5% respectively. An Officer recruited over the age of 60 years will not qualify for a pension and lump sum on reaching the retiring age limit of 65 years. However, any such officer, depending on the circumstances, may be entitled to a short service gratuity or death gratuity.

Duties:

The post holder will perform such duties as are outlined on pages 4-5.

Hours of work:

Normal working hours are 35 worked over 5 days but the appointee will attend at such other times as are required for the proper discharge of the duties of the office. This may require attendance outside normal working hours.

Probation:

The successful candidate will be appointed initially for a probationary period of three months. During the probationary period progress or otherwise will be monitored and at the end of the probationary period the service will (a) be certified as satisfactory and confirmed in writing or (b) if not satisfactory, the probationary period may be extended by 3 months.

Annual Leave:

The annual leave entitlement will be commensurate with professional qualification and experience.

Sick Leave:

Payment of salary during illness will be in accordance with arrangements as approved from time to time by the Department of Health.

Termination of Office:

The employment may be terminated at any time by two months notice on either side except where circumstances are dictated by the Minimum Notice and Terms of Employment Act 1973/91. The Management’s right under this paragraph shall not be exercised save in circumstances where the Management is of the opinion that the holder of the office has failed to perform satisfactorily the duties of the post or has misconducted himself/herself in relation to the post or is otherwise unfit to hold the appointment.

GENERAL ACCOUNTABILITY

The Drug Safety Co-ordinator will:

• maintain throughout the Hospital an awareness of the primacy of the patient in relation to all Hospital activities.
• report to the Head of Pharmacy or Deputy.
• work to ensure optimal patient outcomes from drug therapy by managing risk in the medication management process, and making recommendations for process improvements designed to prevent or minimise error.
• participate in policy formation and development of the medication management process in the hospital.
• participate in continuing education and research activities consistent with the post.

Specific Responsibility

the hospital is a recognised leader in the field of medication safety. Our medication safety programme is integrated with the overall risk management strategy of the hospital. You will facilitate the design and implementation of improvements to the medication use process. You will conduct research and audit with a view to educating the community about medication error. You will assist staff involved in medication management by provision of training as appropriate.

These responsibilities are subject to review by the Head of Pharmacy from time to time.

Principal Functions

1.1 Co-ordinate processes to evaluate and improve medication management through pharmacy, nursing and medical staff.
1.2 Serve as liaison between nursing, pharmacy and medical staff to ensure safe, standardised medication management practices.
1.3 Collaborate in the development of policies and procedures through identification and/or revision with nursing, pharmacy and medical staff.
1.4 Design and implement educational presentations to facilitate the attainment and maintenance of safe medication management practices within the hospital.
1.5 Promptly investigate medication errors in order to improve staff performance and patient care. Individual errors with a NCCMERP severity rating of E – I will be investigated. Errors with a lower severity may be investigated based on aggregate analysis. Use appropriate techniques for analysis of error causation.
1.6 Serve as a resource person by consulting with nursing, pharmacy and medical leadership concerning professional and education problems related to medication safety.
1.7 Analyse any and all aspects of the medication management process and recommends modifications as appropriate.
1.8 Co-ordinate and track projects and initiatives within the hospital related to medication safety and reduction of medication errors.
1.9 Project management to ensure timely completion of reports, identifying data sources and collecting data for established medication safety quality measures, assisting with data analysis, documenting and tracking data specifications and facilitating meetings.
1.10 Assist in development of data collection tools (e.g. surveys, chart abstraction forms) and manage data collection related to these tools for medication safety projects.
1.11 Gather data from internal and external (local, national and international) data sources to establish benchmarks and gather information on lessons learned from other medication safety initiatives that can be applied to our hospital.
1.12 Prepare and present reports for the regular meetings of the Drugs & Therapeutics Committee.
1.13 Promote the continuing development of a system-based, blame-resistant approach to medication error reporting.
2.0 Personal Attributes

The person must have strong communication skills and disciplined task management capabilities. In order to function effectively within the sometimes ambiguous environment and emerging roles, the post holder must have a high level of diplomacy and interpersonal skills. Interfacing with clinicians, senior management and other staff requires substantial flexibility.

3.0 Health and Safety

Safety procedures are in place to comply with the most recent legislation and with the spirit of the hospital's mission, vision and values. Comply with these procedures, and be pro-active in suggesting modifications to bring about improvement.

4.0 Confidentiality

In the course of your employment you will have access to or hear information concerning the medical or personal affairs of patients and/or staff or other health services business. Such records and information are strictly confidential and must not be discussed or divulged except where necessary for the performance of normal duties. In addition, records must never be left in such a manner that unauthorised persons can gain access to them. Records must be kept in safe custody when no longer required.

NOTE:

The extent and speed of change in the delivery of health care is such that adaptability is essential at this level. The incumbent will be required to maintain, enhance and develop their professional knowledge, skills and aptitudes necessary to respond to a changing situation. The Hospital is at the developmental stage therefore, the Job Description must be regarded as an outline of the major areas of accountability at the present time, which will be reviewed and assessed on an on-going basis.

General:

The names and addresses of three referees must be submitted with your application. The Hospital may also refer to present and former employers for reference purposes without further notification to the applicant.

Applications should be submitted in writing, including your Curriculum Vitae, (four copies) together with the names and addresses of three referees

Recruitment Officer
Human Resource Department
XXX Hospital

On or before
JOB DESCRIPTION 3

XXXX HOSPITAL
JOB DESCRIPTION
MEDICATION SAFETY CO-ORDINATOR

November, 2005. (Revised August 2009.)

Qualifications

The successful applicant should:

- Be registered in the Register of the Pharmaceutical Society of Ireland
- Have not less than three years satisfactory post-qualification experience including participation in the medication management process in an acute hospital setting
- Possess the requisite knowledge and ability (including a high standard of suitability) for the proper discharge of the duties of the office

The following are desirable:

- Experience in collecting, managing and analysing healthcare related-data
- Excellent IT skills with experience in using word processing, spreadsheets and databases
- Excellent report writing, organisational and communication skills

Personal Attributes

1. The successful applicant should have:
   - Excellent leadership and motivational qualities, promoting the continuing development of the medication safety strategy
   - Good analytical and presentation skills

2. Applicants must be under the age of 65 years on the first day of the month in which the latest date for completed application forms for the position falls.

3. Applicants must be free from any defect or disease which would render them unsuitable to hold office and be in a state of health as would indicate a reasonable prospect of ability to render regular and efficient service.

4. Be of good character.

Particulars of Office

1. The appointment is whole time.
2. The appointment will cease on attainment of the age of 65 years.
3. Remuneration will be in accordance with the salary scale approved by the Department of Health and Children. The successful candidate may be given incremental credit subject to verification of previous relevant hospital experience of three months. During the probationary period progress or otherwise will be monitored and at the end of the probationary period the service will be either certified as satisfactory or the probationary period may be extended by 3 months.
4. The successful candidate will perform such duties as are outlined below. Normal working hours are 35 worked over 5 days but the post holder may be required to attend at such other times as are required for the proper discharge of the duties of the office. This may require attendance outside normal working hours.

5. The annual leave entitlement is 25 working days per annum (pro rata for length of contract).

6. Payment of salary during illness will be in accordance with arrangements as approved from time to time by the Department of Health and Children.

7. The appointee must give not less than one month’s notice in writing of his/her intention to resign.

General Accountability

The Medication Safety Co-ordinator will:
- Report directly to the Chief Pharmacist, the organisation’s Drugs & Therapeutics Committee, the Forum for Adverse Incidents & Complaints Review, and indirectly to the Medical Executive & the Patient Safety Committee.
- Work to ensure optimal patient outcomes from drug therapy by identifying risk in the medication management process and by making recommendations for process improvements designed to prevent or minimise error.
- Participate in policy formation and development of the medication process in the hospital.
- Develop and maintain good working relationships with key stakeholders in the medication management process.
- Participate in education and research activities linked to the position.
- Represent the organisation at the Irish Medication Safety Network

SPECIFIC RESPONSIBILITY

The Drugs and Therapeutics Committee has responsibility to “participate in the review of medication errors as appropriate” and “to ensure that prescribing and administration of drugs is carried out in a safe and effective manner”. The Drugs and Therapeutics Committee has developed a strategy for optimising patient outcomes by minimising medication incidents. There is a well-established medication incident reporting system in place. An medication incident database is now up and running.

The strategy is to put medication safety as a priority in patient care through:
- Identification of high alert medication safety issues & implementation of policies and procedures in place for managing same.
- Improvement of staff awareness and education in relation to medication incident reporting (e.g. at monthly nurse induction, NCHD induction, Medication safety seminar)
- Provision of feedback to staff on medication incidents.
- Implementing agreed measures to prevent medication incidents.
- Working with ICT on planning and implementation of on-line reporting of medication incidents

The responsibilities of the Medication Safety Co-ordinator are subject to review from time to time by the Chief Pharmacist.
Principal Functions:

RISK RATING & REVIEW OF MEDICATION INCIDENTS

1.1 Review and risk rate Medication Incident Reports (MIRs) internally using (a) NCCMERP index for categorizing medication error, and externally using (b) the Clinical Indemnity Scheme Risk Rating matrix.
1.2 Investigate medication incidents in a timely manner in order to improve patient safety and enhance staff performance.
1.3 Identify trends of incidents, and high alert medication safety issues for the hospital.
1.4 Participate in serious untoward incident review (sentinel event) as required.
1.5 Ensure the electronic database for managing medications incidents, the MIR database is kept updated to facilitate detailed feedback on medication safety issues.

Education & Training

1.6 Promote the development of a dynamic, system based, blame resistant approach to medication incident reporting within the hospital.
1.7 Participate in the teaching and training (including in-service training) of medical, nursing, pharmacy and other staff as may be required.
1.8 Provide educational sessions on medication safety to Hospital staff – e.g. monthly nurse induction, intern induction, feedback to specific clinical areas, seminars as required.
1.9 Assist in the development of data collection tools and manage data collection related to these tools for medication safety projects.
1.10 Gather data from internal and external data sources to establish benchmarks and gather information on initiatives used elsewhere that could be used to prevent medication incidents in this hospital.
1.11 Consult with medical, nursing and pharmacy managers in relation to professional and educational problems associated with medication incidents.

Provision of Reports

1.12 Prepare & provide timely and accurate reports for presentation to the Drugs and Therapeutics, the Forum for Adverse Incident & Complaint Review Patient Safety committees, other committees or departments as requested.

PROCESS IMPROVEMENT – MEDICATION MANAGEMENT

1.14 Co-ordinate processes to evaluate and improve medication management through medical, nursing and pharmacy staff e.g. co-ordination of Drugs & Therapeutics committee working groups on high alert medicines
   - Ensure terms of reference in place & agreed outcomes (guidelines, procedures, policies, prescriptions) from D&T working groups are presented in a workable format.
1.15 Explore the possibility of extending the the hospital model of managing medication incidents to the other hospitals in the the hospital group. the hospital model now implemented in associated private hospital(s).

LIAISON FUNCTION
1.16 Liaise with the Insurance, Risk & Legal Affairs Coordinator & Department of Quality, Risk & Legal Affairs in relation to medication incidents and medication safety.
1.17 Consult the Clinical Audit Co-ordinator in relation to developing a systematic approach to evaluating and improving the medication management process.
1.18 Liaise with medical, nursing and pharmacy staff to ensure safe, standardised medication management processes.
1.19 Medication safety liaison between Drugs & Therapeutics & Forum for Adverse Incidents & Complaint Review
1.20 Represent the hospital at the Irish Medication Safety Network – an independent group of pharmacists and other specialists working in the acute sector, supported by the Clinical Indemnity Scheme, whose principal aim is to improve patient safety with regard to the use of medicines through collaboration, shared learning and action.
1.21 Liaise with the Irish Medicines Board, the Irish Pharmaceutical Healthcare Association, the Pharmaceutical industry and other agencies and stakeholders in relation to packaging, labelling or any measures that could reduce the risks of medication incidents.
1.22 Perform such other duties appropriate to the office, as may be assigned to him/her by the Chief Pharmacist.

**Personal Attributes**

The successful candidate will have excellent communication and project management skills. S/he will also have good interpersonal skills.

**Health and Safety**

The successful candidate must comply with statutory and institutional Health and Safety requirements.

**Confidentiality**

As part of his/her employment, the successful candidate will have access to information concerning the medical, social and personal affairs of patients and /or staff members. This information is strictly confidential and must not be discussed or divulged except where necessary for the performance of normal duties. In addition, such information must not be left in such a way that it is accessible by unauthorised persons.
Appendix III  ACTIONS WHICH WOULD BE CARRIED OUT BY A MEDICATION SAFETY OFFICER

The amount of working time available for an MSO to work was established, based on 253 working days in each year (Working Days n.d.) less the maximum annual leave entitlement of 30 days (Health Services Executive n.d.) and a 7.4 hour working day. Adjusting this for 30% of the pharmacists time to be spent on direct clinical pharmacist duties, on the basis that this would ensure that they remain current in understanding the challenges of medication management, leaves 1,202 hours annually to carry out quality improvement projects. These hours could be spent on the actions outlined in Table 7-1

<table>
<thead>
<tr>
<th><strong>Action:</strong> Co-ordination of medication error and near-miss reporting and identification of trends</th>
<th><strong>Quality Improvement:</strong> Identify risk areas and add them to the risk register in order to prevent further incidents or possible harm occurring in these areas.</th>
<th><strong>Actions</strong> Analysis of medication incidents, either as root cause analysis ** or FMEA ††</th>
<th><strong>Risk mitigated</strong> Reoccurrence of event</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Action:</strong> Networking with other organisations to identify medication safety improvements</td>
<td>Implement process changes to prevent occurrence of errors in hospital.</td>
<td>Implementation of a concentrated electrolytes policy (IMSN 2013)</td>
<td>Inadvertent administration of concentrated electrolyte solution causing death or serious injury.</td>
</tr>
<tr>
<td><strong>Action:</strong> Investigate and suggest changes to medication management processes in the hospital, based on analysis and investigation of locally occurring incidents or</td>
<td></td>
<td>Screen all prescriptions for NSAIDs</td>
<td>Acute renal injury and/or increased risk of stroke or myocardial infarction, particularly in elderly patients.</td>
</tr>
</tbody>
</table>

** Root Cause Analysis is a structured method used to analyze serious adverse events. (AHRQ Patient Safety Network n.d.)
†† Failure Mode and Effects Analysis (FMEA) is a systematic, proactive method for evaluating a process to identify where and how it might fail and to assess the relative impact of different failures in order to identify parts of the process most in need of change (Institute for Healthcare Improvement n.d.)
<table>
<thead>
<tr>
<th>Suggested by ISMP‡‡, IMSN§§, NHS or other international Organisations.</th>
<th>Assess patients for drugs that put them at risk of falls (NHS National Patient Safety Agency 2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provide education to all hospital staff and patients to improve medication safety culture, based on the changes identified above.</td>
<td>Improve patient safety culture and inform stakeholders of actions needed to prevent the occurrence of medication errors.</td>
</tr>
<tr>
<td>Ensure VTE risk assessments take place</td>
<td>Hospital acquired thromboembolism,</td>
</tr>
<tr>
<td>Co-Ordinate readiness for accreditation of the hospital with regard to medication management processes</td>
<td>Helps to achieve standard of patient safety required for accreditation.</td>
</tr>
<tr>
<td>Highlight ISMP high-alert medications (Institute for Safe Medication Practices 2014)</td>
<td>Risk of incorrect medication being used.</td>
</tr>
<tr>
<td>SALADs and Tall Man Lettering (Irish Medication Safety Network 2010)</td>
<td>Risk of patient who is allergic to a medication receiving that medication</td>
</tr>
<tr>
<td>Allergy status alerts (Irish Medication Safety Network 2012)</td>
<td>Multiple risks</td>
</tr>
<tr>
<td>Redesign Medication Prescription and Administration Record</td>
<td>Risk of patient receiving incorrect treatment on admission or after discharge.</td>
</tr>
<tr>
<td>Standardise medicine reconciliation processes</td>
<td>Risk of methotrexate toxicity</td>
</tr>
<tr>
<td>Dispense methotrexate in specific weekly dose only</td>
<td>Multiple risks</td>
</tr>
<tr>
<td>Facilitate pharmacist attendance on ward rounds.</td>
<td>Multiple risks</td>
</tr>
<tr>
<td>Maximise pharmacist time spent in the intensive care unit.</td>
<td>Multiple risks</td>
</tr>
</tbody>
</table>


§§ The Irish Medication Safety Network (IMSN) issues safety alerts, guidelines and briefing documents on medication safety issues in Irish Hospitals. See [www.imsn.ie/alerts](http://www.imsn.ie/alerts)

*** The National Health Service in England and Wales