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ROLE OF CLINICAL PHARMACIST IN CRITICAL CARE AREAS: A REVIEW

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ABSTRACT

Intensive care unit recovery clinics (ICU-RCs) have been proposed as a potential mechanism to address the multifaceted unmet needs of intensive care unit (ICU) survivors and caregivers. The needs of this population include, but are not limited to, medication optimization, addressing physical function and psychological needs, coordination of care, and other interventions that may help in improving patient recovery and reducing the rate of preventable readmissions. The objective of this opinion paper is to identify and describe clinical pharmacy services for the management of ICU survivors and their caregivers in an ICU-RC. The goals are to guide the establishment and development of clinical pharmacist involvement in ICU-RCs and to highlight ICU recovery research and educational opportunities. Recommendations provided in this paper are based on the following: a review of published data on clinical pharmacist involvement in the ICU-RCs; a consensus of clinical pharmacists who provide direct patient care to ICU survivors and caregivers; and a review of published guidelines and literature focusing on the management of ICU survivors and caregivers. These recommendations define areas of clinical pharmacist involvement in ICU-RCs.

INTRODUCTION

Caring for critically ill patients in an intensive care unit (ICU) is considered a standard of care in today's environment. However, the ICUis a rapidly changing, complex, and costly environment where polypharmacy is the norm and medications are frequently used in combinations involving ever-changing doses based on physiologic responses and critical illness-related organ dysfunction. This creates the 'perfect storm' scenario that is ripe for medication errors. A study over a threeweek period in two ICUs in the U.S. found an adverse event rate of 80.5/1000 patient-days, with medications being responsible for 78% of the serious events (Rothschild et al. 2005). This error rate is not an isolated phenomenon; a European study conducted across 27 countries and 113 ICUs involving 1,328 patients revealed that during a brief 24-hour observation period 81% of ICUs reported at least one parenteral medication error that involved 37% of patients (Valentin et al. 2009). This translated into an error rate of 74.5 errors per 100 patient days, with 7 patients experiencing permanent harm and 5 patient deaths due to medication errors. From a cost perspective, medications are the fourth largest contributor to total ICU costs, and account for approximately 38% of total drug costs in a hospital (Weber et al. 2003). Fortunately, the role of pharmacists in reducing medication errors and costs is well established.

Reduce Medication Errors

A landmark study in 1999 reported that pharmacist attendance in ICU rounds reduced the rate of preventable adverse drug events by 66% (Leape et al. 1999). Using the EU study figures, this would extrapolate to over 1200 lives saved every year. Other publications further support improved clinical outcomes due to pharmacist interventions. In a retrospective review of patients with thromboembolic disease, critical care pharmacists were able to significantly reduce patient mortality, ICU length of stay, bleeding complications, and need for blood product transfusions (MacLaren and Bond 2009). Recently, the PROTECTED-UK study involving 21 ICUs over 2 weeks reported that pharmacists reviewed 20,517 medication orders, 3, 294 (16.1%) of which required interventions to optimise medication therapy (Shulman et al. 2015). Of the interventions, the majority (87.7%) were accepted by the prescriber, 6.8% were medication errors and 66% were deemed to be high risk in nature. Other studies have reported estimated cost-savings or avoidance of $1.7-2.1 million over a 2 year period, making a return on investment of 7 to 1 (Weant et al. 2009).

Education, Research, Administration

Critical care pharmacists are a valuable resource in providing education to clinical team members in addition to pharmacist trainees. In a neonatal ICU, a pharmacist-led staff education and risk management programme reduced medication errors from 24.1 to 5.1 per 1000 neonatal activity days (Simpson et al. 2004). Similarly, physician orientation and education were shown to reduce prescribing error rates. A panel consisting of a pharmacist and paediatrician, using a standardised predefined criteria, rated the severity of the errors and found a reduction in severe errors from 29.7% to 7% (Alagha et al. 2011).Critical care pharmacists can also lead and/or participate in clinical research. In a Canadian survey specifically on this topic involving 215 pharmacists, 41.4% reported being moderately to highly Involved in research (Perreault et al. 2012). Finally, pharmacists can also be involved in more administrative/leadership type roles, such as quality improvement. In one pharmacistdriven quality improvement initiative (QI), an interdisciplinary protocol was shown to significantly improve process measure compliance with spontaneous awakening trials from a baseline of 20% to 97-100%, which was sustained 8 months following the programme (Stollings et al. 2015).It would appear that there is an abundance of literature demonstrating ICU pharmacist ability to improve financial, clinical, and process outcomes. It is therefore disheartening to observe that 17 years after the publication of the landmark study (Leape et al. 1999), adoption is far less than 100%, despite wide support by professional organisations and patient safety experts (MacLaren et al. 2006; Brilli et al. 2001). A few barriers and lessons learned are presented below as a starting point to assist those contemplating such an undertaking.

Building the Business Case

For most institutions, in order to obtain a new ICU pharmacist, a convincing business case is required. While specific requirements differ depending on local contexts, this usually involves a needs assessment, an environmental scan of comparator institutions, proposed service model, cost of service (e.g. pharmacist yearly salary and benefits), potential cost savings, and risk-benefit assessment of implementation. An environmental scan can be done locally within the city or health region, published literature, or where available, national data such as the Canadian Hospital Pharmacy report (MacLaren et al. 2006; Hospital Pharmacy in Canada Editorial Board 2015). The caveat is that a significantportion of the overall cost savings made by ICU pharmacists is not in direct drug costs, but in prevention of costs due to errors. This is, albeit very unfortunately, viewed differently by administrators and finance

personnel as not ‘real dollars saved’. Therefore the ‘sales pitch’ often needs to centre on quality of care and/or meeting of regulatory or accreditation requirements, supported by any local/national quality agenda/initiative, and preferably in alignment with institution-specific objectives. Failing that, another method to demonstrate the worth of an ICU pharmacist has sometimes come from a trial period where another pharmacist with the appropriate knowledge/skills is redeployed to practise in the ICU for a short period while documenting the interventions made. This type of trial period allows for gathering of local data, which may be more convincing, but perhaps more importantly, allows the ICU care team to witness first-hand the benefits of having a pharmacist. Often the clinical team members (e.g. nurses and physicians) will become the best champions and advocates. Relationship building with the ICU team is a key factor in success, and this may be established through other channels such as collaborative work in a project for the ICU (e.g. computer order entry implementation) or through pharmacotherapy guideline development during Pharmacy and Therapeutics committee participation.

Education and Training

Training for ICU pharmacotherapy is usually not the focus of many undergraduate pharmacy curricula and ICU clinical rotations/clerkships are often viewed by students as ‘difficult to pass’ rotations. Therefore, students’ interest in ICU as a practice area is not widespread, limiting the qualified recruitment pool when a position is secured. While there are specialty residency programmes in critical care, their availability does not match needs, as demonstrated by the recent survey reporting that only 5.9% of critical care pharmacists have completed a critical care specialty residency (MacLaren et al. 2006). Therefore, finding qualified pharmacists to fill ICU positions is challenging and may result in filling them with less trained personnel, often producing less than optimal acceptance. Fortunately, with dedicated courses in ICU pharmacotherapy appearing in the elective portion of some pharmacy curricula, the addition of board certification in Critical Care Pharmacy by the Board of Pharmacy Specialties in the U.S., more and more training programmes and opportunities will be forthcoming to help close the qualified personnel shortage and needs gap.

Icu Pharmacist Activities

The Society of Critical Care Medicine and the American College of Clinical Pharmacy published a position paper in 2000 on various activities that can/should be performed by an

ICU pharmacist, dividing these activities into fundamental, desirable, and optimal levels (Rudis and Brandl 2000). The list is quite all encompassing, and almost daunting for institutions that currently don't have such a position. Focusing on part of the fundamental activities, along with meticulous documentation of the interventions/outcomes, using either a homegrown or commercially available tool, should be the initial phase before progressing to desirable or optimal activities. This approach is corroborated by the recent U.S. survey where fundamental activities (e.g. providing drug information) are provided by 83.9% of respondents, desirable activities (e.g. therapeutic management advice to physicians) are performed by 63.8% of respondents, and optimal activities (e.g. ICU research) are performed by 19.5% of respondents (MacLaren et al. 2006).

Current Impact In Critical Care

Pharmacists see the entire casemix and so must manage the pharmaceutical care of an extreme range of health problems, as well as quickly assimilate information and management paths for conditions they may not have seen before. Frequently, this can mean making judgements about therapies where there is no evidence, where evidence is contradictory or where there are opposing therapeutic goals. Pharmacists are healthcare scientists and use their underpinning training to good effect in such circumstances.

Optimising medication is a central and key role expected of pharmacists in all clinical areas, not only in critical care. They intercept a large number of prescribing errors, the majority of which have potential for moderate to severe clinical impact. The error rate picked up in ICU runs at a slightly lower rate than in the wider hospital population (6.8% versus 7.5–8.9%), but in addition to this activity pharmacists provide high optimisation rates (8.3%).Clinical impact gradings of critical care pharmacist activity in terms of error intercepts and optimisation activity have been verified by a 30-strong multi-professional panel.

Several studies find that the role of clinical pharmacist reduces overall expenditure through more efficient use of medicines and the avoidance of direct costs of iatrogenic harm, with additional savings made from avoiding payouts arising from damages claims. Overall, pharmacists have been shown to improve the quality of critical care through medicines optimisation, medication error interception and greater regard to standardised therapy whilst reducing medication and care costs.

Future Perspectives

Whilst pharmacists are increasingly embedded into critical care MDTs, significant challenges to the routine delivery of this proven resource exist. Many ICUs do not have pharmacists with the right experience level or who have the minimum required job time resulting in a poor or absent weekend pharmacy service, lack of attendance at ward round and impaired provision of good governance, guidelines, understanding of budgets and prescribing patterns. A national training programme is required to ensure we can meet the demand for advanced-level critical care pharmacists. Staffing models for delivery of true seven day services need further strategic development.

With greater availability comes an enhanced training capability around medicines accessible to all healthcare staff, be that for existing roles such as in medicine, nursing, physiotherapy, etc., or in evolving roles such as advanced critical care practitioners.

Pharmacy technicians (a regulated pharmacy profession) and assistants could be added to the critical care workforce. They will manage aspects of the medicines supply chain, logistics and provision of various kits (intubation, transfer bags, resus trolleys, etc.) and in so doing release nursing time back to doing actual critical care nursing. There are already pilots of pharmacy technicians preparing and administering medicines underway to reduce delayed and omitted doses, they may release nurse time back to other care activities. This could be extended to critical care where nursing time is at a premium and where high-risk medication preparation occurring at bed sides is common.

CONCLUSION

In conclusion, while it is unsatisfactory to see that ICU pharmacists are not present in all institutions that have an ICU, even in countries such as the U.S. and Canada where this practice is much more developed, ongoing support from professional organisations, such as the Faculty of Intensive Care Medicine and the Intensive Care Society in the UK, will hopefully continue to challenge the status quo. Indeed, even in developing countries such as Jordan, India and Brazil, studies on the impact of ICU pharmacists are being published (Leblanc et al. 2008; Hisham et al. 2016; Fideles et al. 2015; Aljbouri et al. 2013). Hopefully in the near future, critical care pharmacists will indeed be ‘critical’ in all ICUs.

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