Evidence Briefings on Interventions to Improve Medication Safety

Interventions to reduce interruptions during medication preparation and administration

Policy question: Are "do not interrupt" interventions effective at reducing interruptions and medication administration errors?

Current evidence shows: Interruptions to nurses have been implicated as a source of error during the preparation and administration of medications. Interventions designed to reduce interruptions among nurses have produced only weak evidence of their effectiveness to reduce interruption rates, and very limited evidence of their ability to reduce medication administration errors. However, this absence of evidence is primarily due to the lack of robust study designs applied to evaluate these interventions. Hospitals should be cautious about adopting these interventions until controlled trials of their effectiveness have been undertaken.

Background

Medication administration errors (MAE) account for 34% of preventable adverse drug events[1], and are more likely to result in serious harm and death compared to other medication errors[2, 3]. There is growing evidence, mainly from qualitative studies, that interruptions are a contributory cause of MAE in hospital[4-7]. However a large study in two Australian teaching hospitals found that interruptions to nurses during medication administration were significantly associated with more medication errors and more severe errors[7]. Interruptions have been identified as a risk factor for task errors in other industries as well[8-12]. An example is the aviation industry which implemented the "sterile cockpit" as standard operating practice to remove non-essential conversations during safety critical tasks[13] such as taking off and landing. This same concept has been applied in different hospitals in the form of 'no interruption zones' for the preparation of medications and the use of 'do not disturb' vests for the administration of medications[14-18]. The effectiveness of such interventions to reduce interruptions during medication preparation and administration in hospitals was assessed in a recent systematic review[19] and the results are summarised here.

Methods

The literature search was undertaken to identify studies published before September 2012 using search terms related to nursing, medication, communication, interruptions and intervention studies. Searches were performed in MEDLINE, MEDLINE In-Process & Other Non-Indexed Citations, Embase, CINAHL and PsycINFO. Google, Google Scholar and the Cochrane Effective Practice and Organisation of Care Group reviews were also searched.

Studies that relied only on self-report for outcomes measurement were excluded[20-26], as were conference abstracts, review articles, duplicates, commentaries and letters.

Results

Eleven articles met inclusion criteria[14, 18, 27-35], two reported results from the same study[31, 32]. Therefore, in total 10 studies were included[14, 18, 27-30, 32-35].

Study characteristics

Seven studies were conducted in the US[14, 18, 27-30, 32], two in Europe[33, 34], and one in Canada[35]. No Australian evaluation studies have been published. Studies were predominately undertaken in one ward in one hospital[18, 27, 28, 32, 33, 35], but the type of wards varied between studies from general medical wards to intensive care wards. Studies on multiple wards[14, 29, 30, 34] did not control for clustering in the analysis, which takes into account similarities in nurses' behaviours on any one ward.[36] Observations were carried out predominantly by nurses employed at the study hospitals. Eight studies used more than one observer,[18, 27-30, 32, 34, 35] but only two studies reported a measure of inter-rater reliability[18, 34]. Nine studies used a before and after design without a control group[14, 27-30, 32-35] and one study used a quasi-experiment three group design (comparing one control group and two intervention groups)[18]. Studies without a control group have difficulty in being able to determine whether any changes observed are due to the intervention being tested or are a result of other factors which may have occurred over time.

Interventions to reduce interruptions

Although all ten studies used the term "interruption", a definition was only provided in four studies[14, 27, 33, 35], one of which made a distinction between interruptions and distractions[33]. The different definitions

applied make direct comparison of results between studies difficult. Interventions designed to reduce interruptions varied and all involved multiple elements[14, 18, 27-30, 32-35].

One study allocated a specific room for medication preparation to eliminate external stimuli[34] and another refurnished the existing medication room to remove everything that was not pertinent to medication administration to reduce interruptions to nurses[27]. Other interventions that were evaluated included "Do not interrupt" vests worn by nurses during medication administration[18, 28, 33, 34], signs requesting nurses administering medications to not be interrupted[27, 28, 32, 33, 35], marked quiet zones for medication preparation[14, 28] and checklists with the medication administration process carried by nurses[18, 33]. Diversion strategies, such as allocating other staff not performing medication administration to attend to phone calls and non-emergency patient inquiries, were also implemented in four studies[18, 27, 28, 32].

Effectiveness of interventions in reducing interruptions

Seven studies which measured changes in overall interruption rates before and after interventions showed a reduction in the rate of interruptions post-intervention[14, 27-30, 32, 33] and one study showed an increase in the interruption rate[34]. Of the seven studies that showed a decrease in interruption rates, four studies[27-29, 32] did not evaluate the statistical significance of the observed change. Another study measured and compared the effect of different interventions on interruptions and found that a combination of three interventions (vests, checklists and diversion strategies) reduced interruptions significantly more than an intervention using diversion strategies alone[18].

Effect of interventions on interruptions by source

Five studies evaluated the change in interruption rate by source[14, 18, 28, 33, 34], but only two assessed the statistical significance of the change[33, 34]. One study found that an intervention comprising vests, ward signs and

checklists significantly decreased the average number of interruptions per medication round hour from staff nurses, conversation, missing medications, noise and other causes; but not from other patients, visitors, doctors and telephone calls[33]. A further study, which implemented vests and allocated a specific room for medication preparation, found a statistically significant decrease in the number of interruptions due to unavailable medications or materials, patient requests, attending to other activities, and answering telephone calls; but not from searching for information, answering patient call bells, managing documentation and other sources[34]. In addition, they found a statistically significant increase in the number of interruptions from other staff members following the intervention.

Effect of interventions on time taken for medication administration

Two studies assessed the effect of interventions on the time taken for medication administration[27, 33]. Both found a decrease in the time taken for medication administration, but neither study evaluated the statistical significance of these changes.

Effect of interventions on medication administration errors

Observed changes in medication administration error rates following an intervention were reported in only three studies[29, 30, 32]. These studies were all related to the same project, the "Integrated Nurse Leadership Program". In these studies, nurses employed at the study hospitals observed the occurrence of medication administrations and then compared observations with medication charts to identify errors. Medication administration errors were defined in terms of categories of errors (e.g wrong dose, wrong route). None of the studies stated whether omitted doses and/or doses given without an order were included in the denominator. Interruptions were measured immediately pre-implementation and up to 18 months post-implementation to evaluate the long-term impact of the interventions. Two studies evaluated and showed a statistically significant reduction in medication administration errors following the interventions implemented [29, 30]. However, multiple interventions, which were different on each study ward, were implemented in these studies. All the interventions were designed to reduce medication administration error rates, but only some specifically targeted interruptions. Thus, it is unclear whether the interventions which were designed to reduce interruptions were the reasons for the reduction in medication administration errors, or if the improved outcome was due to the other interventions which were targeting medication administration errors.

Conclusion

A small number of studies have measured the impact of different interventions to reduce interruptions. The majority of studies provide insufficient detail on the observed sample sizes, definitions for interruptions and medication administration errors, or methods applied. A significant proportion of studies did not assess the statistical significance of intervention effects, nor did they assess the inter-rater reliability for observations, or control for clustering by ward. Observations were carried out by nurses from the study hospitals in the majority of studies, which has the potential for bias as they may have had a vested interest in demonstrating a positive effect from the interventions. These weaknesses, and the fact that most studies were conducted in the USA, usually in only one hospital ward, reduce the generalisability of study findings. There is little evidence of improvements in the evaluation of such interventions, with

several studies published after the systematic review search period demonstrating the same methodological problems as identified in the review[37, 38].

Existing studies of interventions to reduce interruption rates provide weak evidence of their effectiveness. There is even less evidence that reducing interruptions also reduces medication administration errors. It is important to note that not all interruptions are negative. Some are necessary and contribute to patient safety, an issue not considered in detail in the identified studies.

The current evidence base is not sufficient to warrant widespread adoption of such "Do not interrupt"

interventions. However, policy makers and clinicians should not dismiss interventions aimed at reducing interruptions until appropriate controlled before and after studies, and preferably controlled randomised trials, have been performed to assess their value. Further, a greater understanding of the relationships between interruptions, errors in clinical practice and care outcomes, is required as a foundation for the development of interventions designed to reduce interruptions in clinical practice.

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