Embedding electronic medication management systems into practice using implementation science

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A problem

- Medication errors are:

- A key cause of patient harm
- Increase health care costs
- Undermine patient confidence
- Extend patient length of stay

A potential solution

- Electronic medication management systems (EMMS):

- Reduced documentation errors (Westbrook et al (2010))
- Reduced prescribing errors (Westbrook et al (2010))
- Reduced administration errors (Poon et al (2010))
- Improved safety guideline adherence (Samaranayake et al (2014))

However …

There is growing evidence that healthcare professionals do not always use EMMS as they were intended to be used (e.g. Debono et al (2017); Rack et al (2012))

Why?

Traditional approaches to implementing evidence in practice

Top down

- Just try harder
- Policies
- Rules
- Guidelines
- Punishment or reward
- Training
- Restructuring
- Education
- Policies
- Training

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Behaviour Change

- Any intervention requires people to **change their behaviour** – therefore you need to identify and address barriers to them changing behaviour
- Health care can be understood as a **process** – the process is perfectly designed to give you the outcome it gives you - you need to know what the process is before you can change it. To understand barriers to behaviour change, we need to understand the process

Theory and intervention design

Theoretical approaches:

- Explain determinants of behaviour — therefore supports replication, testing, refinement
- Have been demonstrated to be statistically more successful than non-theory driven approaches (e.g. meta analysis Taylor et al (2012))
- Provide theoretical constructs to target
- Allow barriers to be targeted with evidence based behaviour change techniques
- Allow for isolation of the active ingredients of interventions

Using a theoretical approach to identify barriers to medication administration using electronic medication management systems

Theoretical Domains Framework (TDF)

- Comprises 14 domains representing barriers based on psychological and organisational behaviour change theories

- A useful, systematic, theoretically underpinned approach to:
  - detect barriers to behaviour change
  - target behaviours for change
  - inform appropriate theory-based change strategies

Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., Walker, A. 2005, 'Making psychological theory useful for implementing evidence based practice: a consensus approach'. Qual Saf Health Care vol. 14, no. 1, pp. 26-33.

Theoretical Domains Framework (TDF)

Theoretical Domain	Definition
Knowledge	An awareness of the existence of something
Skills	An ability or proficiency acquired through practice
Social/professional role and identity	A coherent set of behaviors and displayed personal qualities of an individual in a social or work setting
Beliefs about capabilities	Acceptance of the truth, reality, or validity about an ability, talent, or facility that a person can put to constructive use
Optimism	The confidence that things will happen for the best or that desired goals will be attained
Beliefs about consequences	Acceptance of the truth, reality, or validity about outcomes of a behavior in a given situation
Reinforcement	Increasing the probability of a response by arranging a dependent relationship, or contingency, between the response and a given stimulus
Intentions	A conscious decision to perform a behaviour or a resolve to act in a certain way
Goals	Mental representations of outcomes or end states that an individual wants to achieve
Memory, attention and decision processes	The ability to retain information, focus selectively on aspects of the environment and choose between two or more alternatives
Environmental context and resources	Any circumstance of a person's situation or environment that discourages or encourages the development of skills and abilities, independence, social competence, and adaptive behavior
Social influences	Those interpersonal processes that can cause individuals to change their thoughts, feelings, or behaviors
Emotion	A complex reaction pattern, involving experiential, behavioral, and physiological elements, by which the individual attempts to deal with a personally significant matter or event
Behavioral regulation	Anything aimed at managing or changing objectively observed or measured actions

Michie, S., Johnston, M., Abraham, C., Lawton, R., Parker, D., Walker, A. 2005, 'Making psychological theory useful for implementing evidence based practice: a consensus approach'. Qual Saf Health Care vol. 14, no. 1, pp. 26-33.

Behaviour change techniques

- The theoretical domains have been mapped to specific ***behaviour change techniques*** (BCTs) (e.g. Michie et al (2008); Cane et al (2015))
- Behaviour Change Techniques (BCTs) are the active components of behaviour change
- A published taxonomy of BCTs can be used to inform the development of interventions to target theoretical domain barriers to behaviour change (Cane et al (2015))

Cane, J., Richardson, M., Johnston, M., Ladha, R., Michie, S. 2015, 'From lists of behaviour change techniques (BCTs) to structured hierarchies: comparison of two methods of developing a hierarchy of BCTs'. British Journal of Health Psychology. Vol. 20, no. 1, pp.130-50.

The Theoretical Domains Framework

Barrier	Behaviour change technique*
Social influences	• Persuasive source • Prompts, cues, social support (unspecified)
Emotion	• Anticipated regret • Salience of consequences • Framing/reframing
Environmental context and resources	• Prompts, triggers, cues • Adding objects to the environment
Beliefs about capabilities	• Instruction on how to perform a behaviour • Behavioural practice/rehearsal

Cane, J., Richardson, M., Johnston, M., Ladha, R., Michie, S. 2015, 'From lists of behaviour change techniques (BCTs) to structured hierarchies: comparison of two methods of developing a hierarchy of BCTs'. British Journal of Health Psychology. Vol. 20, no. 1, pp.130-50.

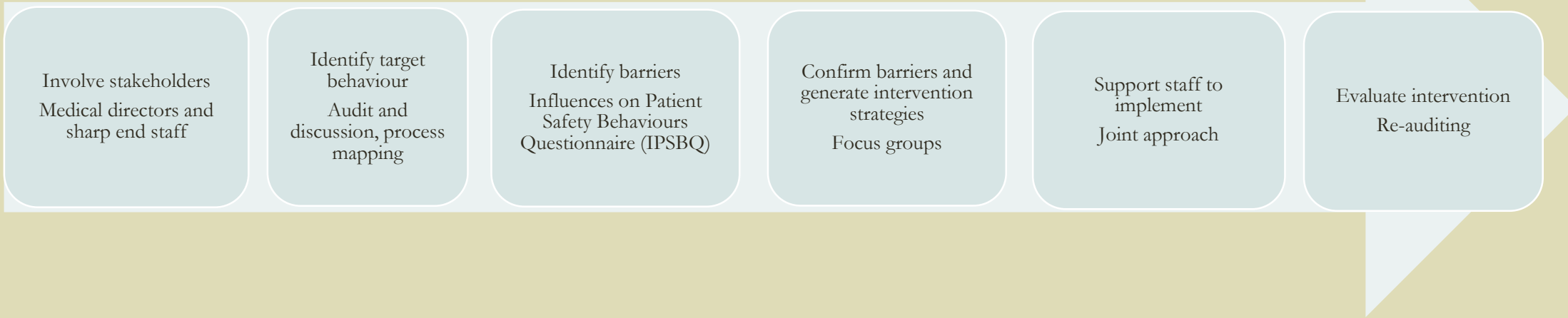
Mapping barriers to BCTs and targeted interventions

Domain	Barrier example	Quote	BCT	Intervention to operationalise BCT
Environmental context and resources	Unavailability of COWs was a barrier to taking an active eMAR to the patient when administering medication.	I think the only thing is if we don't have a laptop for every nurse that's on, that's the big impact. There's always one in the morning that doesn't get the computer. (Nurse 91) During busy times (e.g. morning medication rounds) there were not enough computers (laptops) on wheels (COWs) available for every nurse to use.	Adding objects to the environment ($; @) "Add objects to the environment in order to facilitate performance of the behaviour"(1:S17). Cane et al 2015 assign "Antecedents" to Environmental Context and Resources. This is an example of a BCT in the Antecedent BCT grouping in the Michie et al (2013) taxonomy	Provide additional mobile electronic devices. (A study by Taylor et al (2013) operationalized tis BCT by adding litmus strips to test Ph for nasogastric tube placement (5)).
Social/Professional role and Identity	Being time efficient: An overdue medication alert (OMA) signalled that a medication was an hour overdue. When the OMA was interpreted as a signpost to a nurse being late with a medication rather than the medication being late, nurses cut corners or delayed the medication in the eMAR to avoid or get rid of the OMA.	I: … Like on a busy morning shift, 9 o'clock you're only up to two patients and there are four patients with alarm clock next to it and you feel like a sense of failure maybe. In sense of like you're slow, you're slower than the others. Yeah like you're no good, you've got poor time management. … F: So would you, does the knowledge that the alarm clock is coming affect your practice, affect what you do? I: Yes when they see that people try to rush, people try to rush, because it is mentally a symbol that you want to get off the computer. (Nurse 31) The overdue medication alert (OMA) highlighted that administration of a medication was late. Nurse 31 explained that the OMA made him/her feel like a failure with poor time management. The OMA was a barrier in as much as it made some nurses rush medication administration (described above). In other interviews, nurses described using workarounds to remove the OMA from the screen – either by delaying medication administration or by cutting corners. Responses to OMAs appeared to differ between units and hospitals.	BCT Grouping = Identity* BCT = Framing/reframing Suggest the deliberate adoption of a perspective or new perspective on behavior (e.g. its purpose) in order to change cognitions or emotions about performing the behavior (includes 'Cognitive structuring')" (1:S17).^	Prompt nurses to deliberately adopt a new perspective on the interpretation of the overdue medication alert (OMA). Convey this message during professional development sessions emphasising the OMA as a reminder that medication is late rather than a signpost that the nurse is late.

Debono, D., Taylor, N., Lipworth, W., Greenfield, D., Travaglia, J., Black, D., and Braithwaite, J., 2017, 'Applying the Theoretical Domains Framework to identify barriers and targeted interventions to enhance nurses' use of electronic medication management systems in two Australian hospitals', *Implementation Science*, vol. 12 no.42: DOI 10.1186/s13012-017-0572-1.

Theoretical Domains Framework Implementation (TDFI)

- The TDFI approach uses behaviour change theory and implementation science principles to identify and address key psychosocial and environmental barriers to changing clinical practice



- Figure 1: The Theoretical Domains Framework Implementation Approach

- (Taylor, N., Lawton, R., Slater, B., Foy, R. 2013, 'The demonstration of a theory-based approach to the design of localized patient safety interventions'. Implementation Science, vol. 8, no. 1,123).

Study Aims

1) To use the TDF to examine barriers to nurses' use of electronic medication management systems (EMMS) in everyday practice (Steps 1 – 3 of TDFI)

2) To identify target behaviour, confirm the barriers and work with frontline clinicians to co-design interventions to operationalise BCTs to target barriers to using EMMS (Steps 3 – 6 of TDFI)

Methods

- Ethics approval
- Mixed methods study design – 6 steps
- Setting
- Participants
- Identification of target behaviour
- Process mapping; survey (validated Influences on Patient Safety Behaviours Questionnaire (IPSBQ)); interviews; focus groups

Results

- TDFI approach ‘makes sense’ to front line clinicians
- Target behaviour chosen: *Independent check of all intravenous (IVI) medication administrations by two nurses at the bedside using the EMMS, as per hospital policy*

Results

- Salient barrier domains identified across previous research and in the pilot project included:
  - ❖ environmental context and resources (e.g. availability of functioning mobile computer workstations and staff qualified to co-check IV medications);
  - ❖ social influences (the influence of staff who expressed frustration at being asked to go to the bedside to complete a co-check for IV medication administration);
  - ❖ beliefs about consequences (nurses weigh up the risk to decide which medications they will go to the bedside to co-check);
  - ❖ social/professional role and identity (different professional responsibilities assumed by the administering and checking nurses)

Results

Some of the proposed theoretically informed co-designed interventions targeting specific barriers to two nurses conducting an independent check of all intravenous (IV) medication administrations at the bedside using the EMMS, as per hospital policy include:

- environmental context and resources (e.g. revise process for reporting broken mobile computers, team nursing);
- social influences (e.g. Introduce badges conveying the message "I would love to co-check at the bedside with you" for nurses to wear);
- social/professional role and identity (e.g. Screen savers highlighting that it takes two to check – both are equally responsible);
- belief about consequences (e.g. Provide information about the benefits of two nurses going to the bedside to perform an independent check for IVI medication administration (including "peace of mind")).

Conclusions and next steps

- The TDFI proved to be a useful approach for employing evidence-based methods to identify barriers and co-design intervention strategies

Next steps

- Secure top down (executive) support to implement proposed co-designed theory informed strategies to target barriers to nurses going to the bedside together with the EMMS to independently check IV medications
- Test the effects of targeted strategies on addressing barriers to nurses going to the bedside together with the EMMS to independently check IV medications

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