



Research paper

Optimising a targeted test reduction intervention for patients admitted to the intensive care unit: The Targeted Intensive Care Test Ordering Cluster Trial intervention



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Background: Approaches to routine diagnostic testing in the intensive care unit include time-scheduled testing and targeted testing. Blood tests and chest radiographs requested on a routine, time-scheduled basis may reduce the risk of missing important findings. Targeted testing, considering individual patient needs, may reduce unnecessary testing, wasted clinician time, and costs. However, existing evidence of targeted testing interventions is generally of low quality, and the optimal testing approach is uncertain.

Objectives: The aim of the study was to describe the development of an intervention to reduce unnecessary diagnostic test ordering by clinicians working in intensive care, with the aim of informing the design of a pivotal clinical trial.

Methods: The Capability, Opportunity, Motivation-Behaviour model was used as a theoretical framework for change. The intervention components were informed by systematically identifying, assessing, and classifying targeted testing interventions in behavioural terms. Feedback from intensive care clinicians and patients was sought using surveys and a consumer reference group.

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Results: The mean percentage of routine tests considered unnecessary by 201 intensive care clinicians was 33 (standard deviation = 16). When presented with a statement of the pros and cons for targeted versus liberal testing (n = 154), 93 (60%) consumer survey respondents preferred a more liberal approach, 33 (21%) preferred a more restrictive approach, and 28 (18%) were unsure. There were 24 behavioural interventions identified and incorporated into the final intervention. This had five major components: (i) a management committee to acquire, disseminate, and coordinate intervention-related information, (ii) a targeted testing guideline for sites, (iii) educational material for sites, (iv) site medical and nursing champions, and (v) site audit and feedback.

Conclusions: Although surveyed intensive care clinicians report substantial unnecessary routine diagnostic testing, on the basis of currently available evidence, consumers prefer a more liberal approach. This feedback, and a framework to identify behavioural interventions, has been used to inform the design of a proposed targeted testing clinical trial.

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1. Introduction

Frequent diagnostic testing is a cornerstone of intensive care practice. Blood tests and chest radiographs are often requested as an order set on a routine, time-scheduled basis. Standardisation of the testing type and frequency may promote consistency and reduce the risk of missing important findings. An alternative approach, targeted at considering the needs of the individual patient, may result in fewer false-positive findings, diminished blood loss, lower intravascular device contamination, and additional time for doctors and nurses to spend on direct patient care activities. Given that a substantial proportion of healthcare spending is wasted and that diagnostic tests account for a substantial proportion of intensive care unit (ICU) costs, replacing routine, time-scheduled testing with a targeted approach may add value, resulting in fewer unnecessary tests and substantial time and cost savings.^{1,2}

The Targeted Intensive Care Test Ordering Cluster Trial (TICTOC) will implement and evaluate a targeted diagnostic testing intervention. This will address the routine diagnostic test ordering behaviour of ICU clinicians that can result in performing unnecessary diagnostic tests. TICTOC is a cluster-randomised, stepped wedge, registry-embedded trial that will include approximately 75,000 critically ill patients from more than 66 ICUs in Australia and New Zealand. The trial will test the hypothesis that a targeted testing intervention is noninferior to routine ordering with respect to in-hospital mortality, and is informed by a pilot study and a recent systematic review.^{3,4}

Guidelines for complex healthcare interventions recommend that the intervention is developed within a theoretical framework.⁵ A framework can provide a robust method of identifying the optimal behavioural components to incorporate into the intervention. This process can also help by allowing subsequent mechanisms of action to be described, ensuring high-fidelity implementation and accurate replication after conclusion of the trial.

The aim of this manuscript is to describe the development of the TICTOC intervention, designed to reduce unnecessary diagnostic test ordering by clinicians working in the ICU, and to describe the theoretical framework that underpins it.

2. Methods

We used the Capability, Opportunity, Motivation-Behaviour (COM-B) model in combination with the taxonomy of behaviour change techniques (BCTs), as a theoretical framework for change.^{6,7} BCTs are defined as “the observable, replicable, irreducible component of an intervention designed to alter or redirect causal

processes that regulate behaviour”.⁶ In the COM-B model, the problem is first framed in behavioural terms, i.e., ‘*what is the behaviour that the intervention seeks to address?*’ Then, potential BCTs are considered and categorised as addressing capability, opportunity, or motivation as the necessary and sufficient components to elicit behavioural change.

To develop the TICTOC intervention, a comprehensive list of successful targeted testing interventions was created and refined. The intervention design incorporates stakeholder feedback from the TICTOC management committee; ICU clinicians, patients and the next of kin, and a consumer reference group; and experiences in conducting a pilot study.⁸ The design and development processes were iterative and are summarised in Fig. 1.

2.1. Identifying successful targeted testing behavioural change techniques

A systematic review investigating the association between ICU targeted testing and hospital mortality was recently conducted, and the methods and findings were reported.³ This review was used to develop the components of the TICTOC intervention by identifying, extracting, and classifying all BCTs reported in eligible studies.⁶ This created a long list of possible components for the candidate intervention that was reviewed by the TICTOC management committee to identify any gaps. The list was prioritised through stakeholder consultation, using the COM-B approach of considering impact, likelihood of change, effect on other behaviours, and ease of measurement.⁷ From the prioritised list, BCTs that were considered unacceptable or unfeasible to deliver as part of a large cluster RCT (randomised clinical trial) were removed. The remaining BCTs were then aligned with the relevant COM-B components (capability, opportunity, motivation) and assessed against the APEASE criteria (Affordability, Practicability, Effectiveness, Cost-Effectiveness, Acceptability, Side-effects/Safety, Equity). The APEASE criteria are designed to assist in making context-specific decisions on the content and delivery method of an intervention.⁷ The components that met these criteria were incorporated in the TICTOC intervention.

2.2. Stakeholder consultation

The development of the TICTOC intervention has involved several stakeholder groups including the TICTOC management committee, ICU clinicians, patients and the next of kin, and a consumer reference group. The TICTOC management committee includes experts in intensive care medicine and intensive care nursing, behavioural and implementation science, clinical trial design, health economics, clinical quality registries, and a

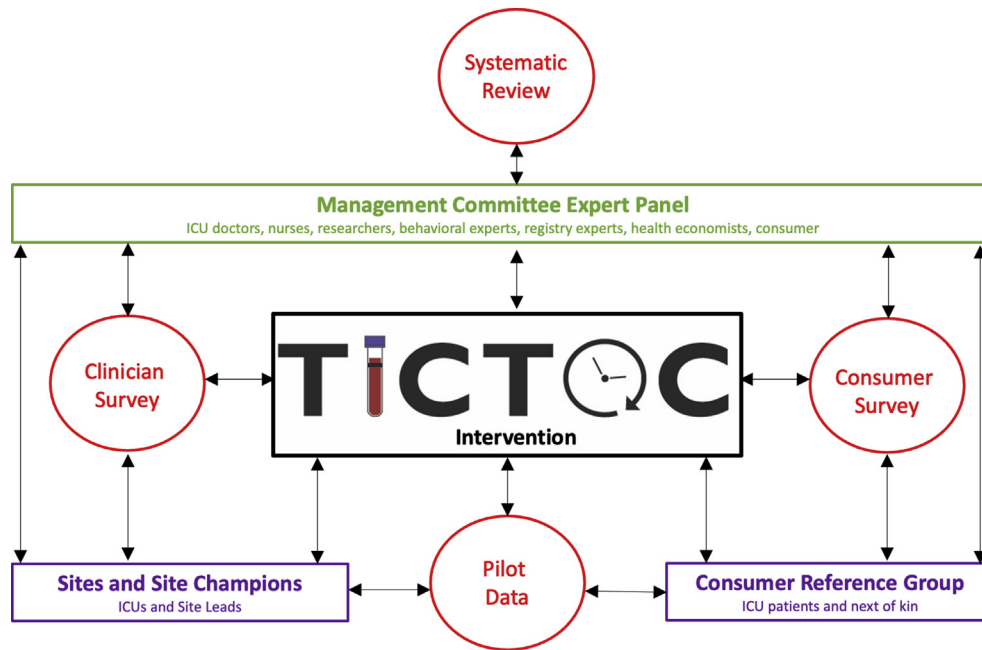


Fig. 1. Information sources and groups used to inform the TICTOC intervention. TICTOC, Targeted Intensive Care Test Ordering Cluster Trial; ICU, intensive care unit.

consumer. In addition to providing overall responsibility for TICTOC, the management committee has assisted in classifying BCTs extracted from the published systematic review and identifying any behavioural gaps, i.e., additional potentially effective interventions not previously reported in the literature. Disagreements about the importance or relevance of individual BCTs were resolved by consensus amongst management committee members.

To include consultation from key stakeholders, two surveys were developed: one for ICU clinicians and one for ICU patients and self-identified ICU next of kin (a family member or friend of a patient admitted to the ICU). Both surveys were piloted and assessed for content and face validity, and the wording but not the number of questions was refined after feedback from three clinicians and two consumers. A seven-question ICU clinician survey was distributed electronically via SurveyMonkey to ICU clinicians (nurses, junior doctors, and senior doctors) across Australia between February and July 2020 (St John of God Health Care Human Research Ethics Committee, ref: 1638). The aim was to inform reported capacity to reduce unnecessary diagnostic testing and the potential for the outcomes of the TICTOC trial to influence clinical practice (see [supplementary appendix eFig. 1](#) for survey questions). A four-question survey was distributed to ICU patients and their next of kin with the aim of informing the importance of routine diagnostic testing to ICU patients and the next of kin (see [supplementary appendix eFig. 2](#) for survey questions). The consumer survey was conducted online, enrolling ICU patients and their next of kin at Sir Charles Gairdner Hospital, a tertiary public hospital in Perth, Western Australia (institutional approval as a quality improvement initiative, ref: 22399).

To provide consumer representation throughout the design, implementation, and analysis phase of TICTOC, a consumer reference group, entirely different from the management committee, was formed, comprising four previous ICU patients and next of kin. Prospective members were identified in collaboration with the Western Australian Consumer and Community Health Involvement Program.⁹ The TICTOC consumer reference group was provided with a brief lay summary material before the meetings and then met for two focus group sessions during the intervention design

phase. The first was convened to consider the importance of reducing unnecessary testing from a consumer perspective. The second was convened to provide input into the proposed intervention. Meetings were not recorded, but key themes and quotes were transcribed contemporaneously and fed back during and after the sessions to gain consensus. The results of the focus group sessions were also presented by both a consumer advocate and a member of the TICTOC management committee for further input and feedback at Australian and New Zealand Intensive Care Society Clinical Trials Group Annual Scientific Meeting in March 2020. A draft version of this manuscript was provided to consumer forum members with the opportunity to provide feedback.

3. Results

3.1. Identifying and classifying existing behavioural change techniques

The results of the systematic review, as they related to the safety and efficacy of targeted testing interventions, have been reported.³ Overall, targeted testing interventions resulted in substantial decrease in tests ordered. Although no difference was demonstrated in mortality, the certainty of the evidence for patient-centred outcomes was low.

Of the 26 studies of targeted testing interventions included in the systematic review, 25 (96%) reported a reduction in test ordering. In total, 66 BCTs were reported, including 10 studies that reported a single intervention and 16 studies that reported multiple targeted testing interventions ([Table 1](#)). No studies reported using a theory-based framework for the description, development, implementation, or measurement of established, well-defined BCTs. The long list of the targeted testing interventions mapped to 11 different clusters and 34 specific BCTs. No BCTs were identified in the clusters of identity, scheduled consequences, self-belief, or covert learning. From the long list of candidate behavioural interventions, 23 BCTs were assessed by the TICTOC management committee as promising (unshaded BCTs in [Table 1](#)).

Table 1
Mapping of targeted testing behavioural change techniques.

Cluster	Behavioural change technique	Targeted testing behaviour ^a	Number of studies
Goals and planning	Outcome goal setting	Identifying specific diagnostic tests needing reduction	1
		Quantified overservicing to target reduction	1
		Clinical champions established improvement targets	1
		Focus on tests performed in most patients	1
		Allow the ICU to set meaningful and feasible goals	1
Feedback and monitoring	Action planning	Guideline creation	11
		Feedback on outcomes of behaviour	1
		Refinement of guidelines after feedback	1
Social support	Unspecified social support	Monthly audit and feedback by email and by meetings to the ICU team	4
		Identification and correction of the upward testing trend	1
		Identification of nurse and medical champions	2
		Creation of a multidisciplinary management committee	1
Shaping knowledge	Practical social support	Provision of a research assistant in the ICU ^b	1
		Formal training of team members in alternative procedures such as lung ultrasound ^c	1
		Instruction on how to perform the behaviour	1
		Redesign of the test order form ^d	1
		Creation of a test order form and process requirements ^e	1
Natural consequences	Information about antecedents	Instruction on how to perform alternative behaviour, such as lung ultrasound ^c	1
		Information about health consequences	1
		Review of baseline activity to identify opportunities for improving	1
Comparison of behaviours	Social comparison	Face-to-face staff education about costs of tests, including at orientation	9
		Email, posters, and flyer education	3
Associations	Prompts/cues	Provision of monthly reports of individual ICU change relative to other participating ICUs	2
		Dashboard for participating ICUs ^f	1
		Addition of order review to the rounding checklist	3
Repetition and substitution	Behaviour substitution	Addition of a prompt to computerised order to specify a testing indication	1
		Place the guideline at each bedside	1
		Addition of test costs to the prescription form ^d	1
		Place costs of tests in the help guide in each patient room ^f	1
Comparison of outcomes	Credible source communication	Removal of daily order option from electronic ordering	2
		Removal of daily ordering as manual routine	6
		Creation of a new form to state order indication ^e	2
Rewards and threats	Material incentives	Literature review before intervention	2
		Acquisition and dissemination of available evidence	1
Antecedents	Reducing cue exposure	Group-based financial incentives for physicians ^b	1
		Reward only if there has been progress	1
		Feedback of success in reducing testing to staff to help reinforce practice change	1
		Change ordering to the consultant	1

ICU, intensive care unit.

^a Dark shading—deemed not acceptable, light shading—deemed unpromising and not worth further considering, no shading—deemed quite promising or very promising.

^b Costs prohibitive across multiple centres in a large-scale trial.

^c Training not considered practical in the context of a large-scale trial.

^d Impractical to standardise in the setting of a large-scale trial.

^e Aversion to adding additional requirements.

^f Of uncertain benefit and sustainability.

The 23 targeted testing interventions determined to be promising and relevant to the proposed study design by the management committee were grouped as per the COM-B theoretical framework. One additional promising targeted testing intervention was identified that had not been previously reported. This involved liaising at a site level with pathology and radiology services and business managers. The groupings identified a need to address psychological capability, physical opportunity, social opportunity, and reflective motivation. These created a structure for a draft intervention with five major components: (i) a management committee to acquire, disseminate, and coordinate intervention-related information, (ii) a targeted testing guideline for sites, (iii) educational material for sites, (iv) site medical and nursing champions, and (v) site audit and feedback. The alignment of targeted testing behaviours with the COM-model B and draft intervention components is provided in Table 2.

3.2. Stakeholder feedback

There were 201 respondents to the ICU clinician survey, including 99 (49%) nurses, 58 (29%) senior doctors, and 44 (22%) junior doctors. The mean proportion of routine blood tests and chest radiographs considered unnecessary was 33 (standard

deviation = 16), and 93% of respondents agreed that they would adopt the TICTOC intervention in the context of a cluster trial with a 1.5% noninferiority margin for hospital mortality as the primary end point (see supplementary appendix eTable 2 for the complete results).

There were 154 respondents to the ICU consumer survey, including 103 (67%) patients and 51 (33%) of their next of kin. The number of respondents agreeing, not being sure, or disagreeing with the statement “research demonstrating routine blood tests and chest x-rays could be reduced, without compromising patient care, would provide important benefits to ICU patients” was 104 (68%), 25 (16%), and 25 (16%), respectively. When presented with a statement of inconclusive evidence for targeted versus liberal testing and the pros and cons of each, the preferred approach to testing was more liberal for 93 (60%), more restrictive for 33 (21%), and unsure for 28 (18%) respondents (see supplementary appendix eTable 3 for the complete results).

These findings were consistent with the two main themes that emerged from the consumer forums: a clear recognition (i) that unnecessary testing may be harmful and (ii) that addressing this should not be perceived to be primarily about cost saving. As stated by one consumer, “every unnecessary test is like an additional trauma”. But equally, the caution is that “we need to do what is right

Table 2

Draft Intervention: alignment of the COM-B model and intervention components.

COM-B components	Targeted testing behaviour	Intervention and what needs to happen for the target behaviour to occur?
Capability – Psychological knowledge; cognitive and interpersonal skills; memory, attention, and decision processes; behavioural regulation	<ul style="list-style-type: none"> - Identifying specific diagnostic tests needing reduction - Quantified overservicing to target reduction - Focus on tests performed on most patients - Creation of a multidisciplinary management committee - Literature review before intervention - Acquisition and dissemination of available evidence - Guideline creation - Addition of order review to the rounding checklist - Addition of a prompt to computerised order to specify a testing indication - Place the guideline at each bedside - Removal of the daily order option from electronic ordering - Removal of daily ordering as manual routine 	<p>A multidisciplinary management committee Review and interpret the literature, develop and disseminate all intervention components to sites, and take responsibility for all aspects of the trial.</p> <p>In developing the intervention, the management committee will consider the specific diagnostic tests needing reduction and the tests performed on most patients and developing the relationships, structure, and processes to ensure all elements of the intervention are coordinated and delivered.</p> <p>The management committee will liaise with other stakeholders including the consumer representation group and the site medical and nursing champions.</p> <p>A targeted testing guideline The master guideline will include recommendations for incorporation of all the relevant BCTs including where (at each bedspace), when (the addition of order review to the rounding checklist, prompts for electronic ordering), and how (removal of daily order options). The guideline will be hierarchical beginning with broad concepts and ending in specific tests and timing. It will be adaptable to the baseline conditions and priorities of each participating site.</p>
Opportunity – Social influences	<ul style="list-style-type: none"> - Clinical champions established improvement targets - Refinement of guidelines after feedback - Identification of nurse and medical champions - Review of baseline activity to identify opportunities for improving - Involve, at a site level, pathology and radiology staff and business managers^a 	<p>Medical and nursing champions Each participating site will nominate one medical and one nursing champion who will be the primary contact to help assist with review of baseline activity to identify opportunities for improving, refinement of the guidelines for the site, the delivery of the intervention at each site, and liaising with the multidisciplinary management committee. Site champions will also provide the liaison with site pathology and radiology services and the ICU business managers.</p>
Opportunity – Physical environmental context and resources	<ul style="list-style-type: none"> - Face-to-face staff education about costs of tests, including at orientation - Email, posters, and flyer education 	<p>Education material Face-to-face staff education material in the form of audio/visual presentations will be prepared by the multidisciplinary management committee. Posters and flyers will also be prepared.</p> <p>The education material will include the pros and cons of targeted testing, the results of the literature review, an overview of healthcare costs, and trends and specifics of costs of tests at each site.</p>
Motivation – Reflective professional/social role and identity, beliefs about capabilities, optimism, beliefs about consequences, intentions, goals	<ul style="list-style-type: none"> - Allow the ICU to set meaningful and feasible goals - Monthly audit and feedback by email and by meetings to the ICU team - Identification and correction of the upward testing trend - Provision of monthly reports of individual ICU change relative to other participating ICUs 	<p>Audit and feedback Site champions will provide the multidisciplinary management committee with aggregate tests per patient bed day. The management committee will collate the data from each site and feed it back to each site in an aggregate, de-identified format. Feedback will allow sites to track change over time towards the preset goal and identify and correct any upward trends.</p> <p>Feedback will also allow comparison and benchmarking with other sites.</p>

ICU, intensive care unit; COM-B, Capability, Opportunity, Motivation–Behaviour; BCT, behaviour change technique.

^a Additional intervention identified as a gap in existing targeted testing behaviours.

for each patient". There was general agreement that the treating ICU clinician was best placed to assess this need. The proposed intervention components were deemed to be appropriate, and the themes that emerged from the forums were incorporated into the TICTOC intervention by focusing on the benefits of diagnostic testing that considered each patient individually, i.e., targeted testing, with the final authority for each patient resting with the treating ICU clinicians.

3.3. Draft intervention

The intervention has five components: (i) a multidisciplinary management committee, (ii) a targeted testing guideline, (iii) site

medical and nursing champions, (iv) site clinician education, and (v) monthly site audit and benchmarked feedback. The main roles of each component are described in Table 2. The five components were all assessed favourably against the APEASE criteria of affordability, practicability, effectiveness, cost-effectiveness, acceptability, side-effects/safety, and equity (Table 3). An example of the intervention components for one study site and how these interact at the site level and with other study sites are provided in Fig. 2. The draft intervention addresses economic and organisational barriers identified in implementing previous critical care quality improvement initiatives including a lack of skilled practitioners, equipment, and appropriate patients and lack of a pressing need for change.¹⁰ TICTOC overcomes these barriers by (i)

Table 3
Intervention components: APEASE criteria.

Intervention component	Affordability	Practicability	Effectiveness	Cost-effectiveness	Acceptability	Side-effects/Safety	Equity
Multidisciplinary management committee	In-kind support from relevant experts	Strong track record of previous collaboration	Effective in previous targeted testing interventions	Not previously assessed but will be included in TICTOC outcome evaluation	Strong track record of similar successful research governance structures	An important responsibility will be to review site safety data	Equally available to all participating sites
Targeted testing guideline	Low cost to produce master and site guidelines	A master guideline with fixed and adaptable elements to be practicable for different sites	Effective in previous targeted testing interventions	Cost-effective in previous targeted testing interventions	Uncertain, although respondents to the site survey report substantial unnecessary testing	Available evidence of low quality but suggests minimal or no safety concerns associated with targeted testing. A primary rationale for the pivotal trial is to provide definitive safety evidence. No safety issues	Context, adaptable, but equally available to all participating sites
Medical and nursing champions	Costs of educating champions born by trial. Costs of champions assisting with delivery of the intervention at sites shared between trial and sites	Self-identified medical and nursing champions for each site to increase practicality	Effective in previous targeted testing interventions	Not previously assessed but will be included in TICTOC outcome evaluation	Champions from each site should increase acceptability of the intervention to sites	No safety issues	Context adaptable but equally available to all participating sites
Education materials	Costs of developing education materials moderate and born by the trial. Costs of delivery shared between trial and sites via champions	Established method for practice change and onboarding of new staff in all health care facilities	Effective in previous targeted testing interventions	Not previously assessed but will be included in TICTOC outcome evaluation	Widely accepted as a means of disseminating information and acquiring new skills. Adaptable to include site-specific information including test costs	No safety issues	Equally available to all participating sites
Audit and feedback	Use of aggregate, clinically available data means costs are minimal	All sites have the capacity to collect the required information as part of routine care so highly practicable	Effective in previous targeted testing interventions	Not previously assessed but will be included in TICTOC outcome evaluation	Data only transferred in aggregate, so no patient privacy issues, plus de-identified benchmarking increases acceptability	No safety issues	Equally available to all participating sites

TICTOC, Targeted Intensive Care Test Ordering Cluster Trial.

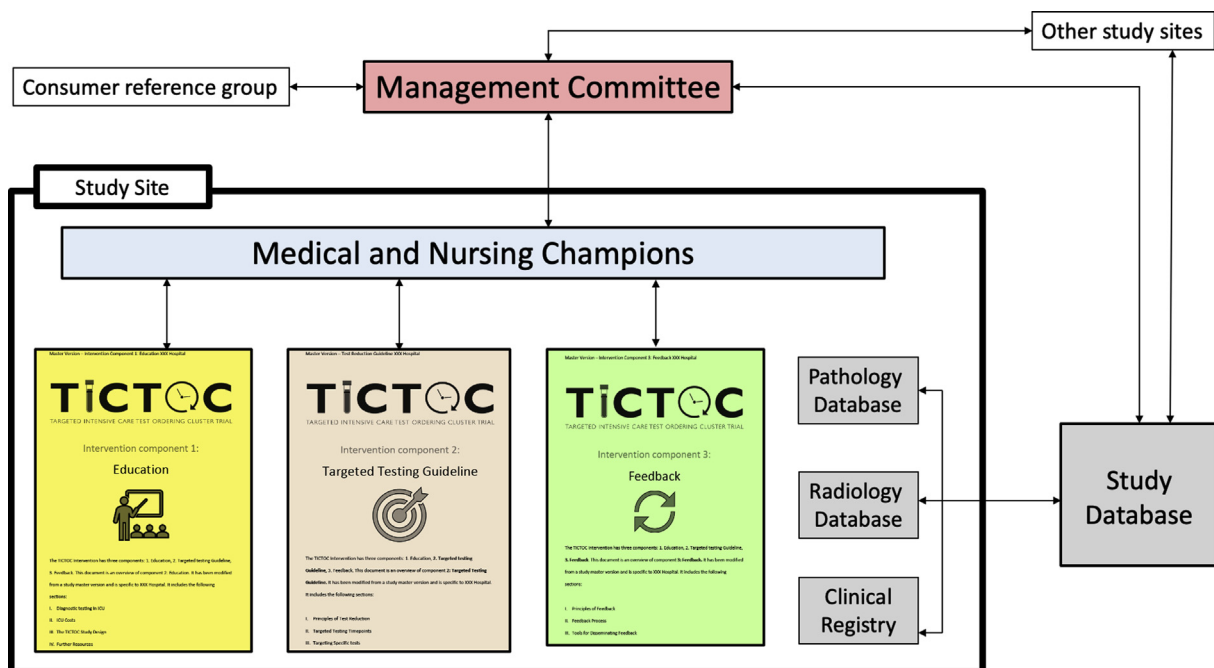


Fig. 2. Intervention components.

addressing an issue identified to be important to ICU clinicians and consumers, (ii) ensuring that the intervention is relevant and generalisable within and between ICUs, (iii) developing an intervention that is evidence based and simple to implement, and (iv) providing site support from a skilled central study team and educating site champions.

The final intervention will be reported in the protocol based on the Better reporting of interventions: template for intervention description and replication checklist and guide.¹¹

4. Discussion

The development and theoretical underpinning of the TICTOC intervention to reduce unnecessary diagnostic test ordering by clinicians working in the ICU has followed an iterative process underpinned by the COM-B theoretical framework and informed by a literature review, stakeholder consultation, and pilot study data. This process has led to a draft intervention with five components: a multidisciplinary management committee, targeted testing guideline, medical and nursing champions, site education, and audit and feedback.

The COM-B model has been used previously to develop complex interventions.^{12,13} However, evidence of widespread use of the COM-B framework or other comparable frameworks to develop complex interventions for trials involving critically ill patients admitted to the ICU is lacking. By using the COM-B framework, relevant behavioural change techniques with demonstrated performance have been categorised into components of the final intervention. This structured description structure will assist during the trial to describe the underlying mechanisms of action, ensure that implementation is consistent, and provide a template for faithful study replication.

Although there are a substantial number of studies reporting interventions to reduce unnecessary diagnostic testing in ICU, the quality of these studies is generally low, and none report a theory-based framework for intervention development.³ Consequently, the safety and efficacy of targeted testing interventions remains uncertain. In contrast to existing studies, TICTOC has sought to identify and extract previously reported BCTs and use these to create a comprehensive targeted test reduction intervention with the aim of conducting a pivotal RCT. In addition to delivering an optimal intervention, the use of a behavioural framework will enable determination of the effectiveness of each of the five intervention components to be identified and the potential causes of variation between sites to be explored.

Consumer feedback on the TICTOC intervention from surveys and focus groups suggests that routine diagnostic testing in the ICU is an area of substantial interest. Although ICU patients and their next of kin reported high levels of agreement for the planned intervention, a majority believe that more liberal testing is currently preferable, possibly owing to the current lack of definitive evidence to support a targeted approach. These findings support the need for further research to develop an optimal diagnostic testing approach.

The TICTOC intervention development process has several limitations. First, there is a risk of bias in relation to feedback from stakeholders, particularly as the number of survey nonrespondents and their opinions are unknown, and verbatim recordings of consumer forums did not occur. Nevertheless, surveys were distributed widely and reflect the opinions of a substantial number of stakeholders, and members of the consumer forum reviewed the summarised findings. Second, interpreting the variability in the reported outcomes of complex interventions and delivering an intervention that can be replicated in the future requires contemporary fidelity of implementation assessment. This is not addressed

in the design of the intervention but will be incorporated as part of the process evaluation into the trial protocol. Third, given the variability in ICU size and staffing models, strict reliance on only two champions at each site may be insufficient at larger sites and may require adaptation, scaled to local circumstances. Fourth, the APEASE criteria were applied without consumer consultation, which may limit the consumer voice. However, ongoing consumer input is built into the TICTOC design, including representation on the study management committee. Finally, behaviours, including those of clinicians towards diagnostic testing, may change over time, and the effect of secular trends on any targeted testing intervention remains uncertain.

5. Conclusion

Although surveyed intensive care clinicians report substantial unnecessary routine diagnostic testing, on the basis of currently available evidence, consumers are supportive of more research, but prefer a more liberal approach. This feedback, and a framework to identify behavioural interventions, has been used to inform the design of a proposed targeted testing clinical trial.

Conflict of Interest

The authors declare no conflict of interest

CRediT authorship contribution statement

The authors approve the final version of the work and agree to be accountable for the work. Helen Atkinson contributed to conceptualisation, methodology, analysis of the work with focus on integration of methods, and redrafting. James Anstey contributed to conceptualisation, methodology, analysis of the work with a clinical and research focus, and redrafting. Matthew Anstey played a lead role in conceptualisation, methodology, analysis of the work, and redrafting. Lewis Campbell contributed to clinical and research focus on conceptualisation, methodology, analysis of the work, and redrafting. Andrew Forbes contributed to conceptualisation, methodology, and analysis of the work with statistical focus. Rebecca Hahn contributed to methodology, analysis of the work, and redrafting with clinical nursing perspective. Katherine Hooper contributed to conceptualisation, methodology, and analysis of the work. Jessica Kasza contributed to conceptualisation, methodology, and analysis of the work with statistical focus. Sharon Knapp contributed to conceptualisation, methodology, and analysis of the work with consumer focus. Edward Litton contributed to conceptualisation, methodology, and analysis of the work and wrote the first draft. Forbes McGain contributed to conceptualisation, methodology, analysis of the work, and redrafting with clinical focus. Nhi Nguyen contributed to conceptualisation, methodology, and analysis of the work with clinical and implementation focus. David Pilcher contributed to conceptualisation, methodology, analysis of the work, and redrafting with clinical research and registry focus. Benjamin Reddi contributed to conceptualisation, methodology, analysis of the work with clinical and research focus, and redrafting. Chris Reid contributed to conceptualisation, methodology, and analysis of the work. Suzanne Robinson contributed to conceptualisation, methodology, analysis of the work, and redrafting with implementation science focus. Kelly Thompson contributed to conceptualisation, methodology, analysis of the work, and redrafting. Steve Webb contributed to conceptualisation, methodology, analysis of the work, and redrafting; and Paul Young contributed to conceptualisation, methodology, analysis of the work, and redrafting.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.aucc.2020.11.003>.

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