Appendix 1: Mock stewardship project

Based on internal data indicating that tests such as complete blood counts and electrolyte panels were frequently repeated when previous test results were in the normal range, the multidisciplinary laboratory stewardship committee at a hospital decided to implement an initiative to reduce repetitive routine testing on hospitalized inpatients. A project team was set up which included an internal medicine physician leader and nurse leader, two laboratory leaders, two patient advisors, a quality improvement practitioner, and a data analyst.

As their first step in planning the initiative, the team attempted to understand who is involved in the testing process and their actions as they relate to test ordering. They observed ward rounds on the internal medicine ward over the course of a week and noted any actions that were taken in relation to ordering of complete blood counts and electrolyte panels, and who did those actions. Over the course of another week, they also had a series of informal conversations with resident physicians, nurses, and attending physicians working on the internal medicine ward, and asked them to describe their role in clinical decision-making pertaining to complete blood counts and electrolyte panels, including selecting these tests/requesting that they be ordered, making the order for the test, requesting the results of the test, interpreting the results of the test, and making further clinical decisions subsequent to the test results. They were also asked what others in different roles on their team do as it relates to this. Using this information, the team mapped out all of the behaviours and the links between them. They then selected one of the behaviours as the one to initially target for the first initiative, keeping the diagram for further reference in the future should they decide to subsequently target other behaviours in future initiatives focused on this topic. The selected target behaviour was then specified in accordance with the AACTT framework, as follows: **resident physicians in the internal medicine ward placing orders for complete blood counts and electrolyte panels for stable inpatients when inputting lab orders at the beginning of the day**.

Once a target behaviour had been selected, the team selected outcomes with which to evaluate the impact of the initiative which corresponded to the target behaviour. The outcomes selected were the number of electrolyte panels ordered per inpatient day; the number of complete blood count tests ordered per inpatient day; the volume of blood drawn per inpatient day; hospital length of stay; and the number of readmissions within 30 days.

Next, the team did some further work to investigate the drivers of this behaviour, and the barriers to and enablers of behaviour change. They did this by having another set of informal conversations with the residents (some of the same individuals they had already spoken to, and some different). The questions guiding the conversation were informed by the TDF, to try and identify what drives selection of those tests, and what would need to change for them to change their behaviour. The residents were asked questions such as:

- ❖ **Knowledge:** Do you use any guidelines or local policies when placing orders for complete blood counts and electrolyte panels?
- ❖ **Beliefs about capabilities:** How easy or difficult would it be for you to stop placing orders for complete blood counts and electrolyte panels for stable inpatients? What would make it easier?
- ❖ **Beliefs about consequences:** What do you think would be the positive impacts of you stopping placing orders for complete blood counts and electrolyte panels for stable inpatients? (for yourself, your patients, your colleagues, your setting?)
- ❖ **Beliefs about consequences:** Are there any negative impacts that you think would occur? (for yourself, your patients, your colleagues, your setting?)
- ❖ **Environmental context and resources:** Is there anything in your work environment that influences you to place orders for complete blood counts and electrolyte panels for stable inpatients?
- ❖ **Social influences:** How might the views or opinions of others affect you placing orders for complete blood counts and electrolyte panels for stable inpatients? (such as colleagues; supervisors; patients; others?)
- ❖ **Emotion:** Would you have any worries or concerns about stopping placing orders for complete blood counts and electrolyte panels for stable inpatients?

Based on the participants' responses, a list of barriers to and enablers of change for each TDF domain was generated. The project team then selected priority barriers/enablers to focus on which were relatively often mentioned, could be feasibly addressed with the resources available for the initiative, and which were relatively likely to lead to the desired behaviour

change if addressed. Three barriers selected were:

- ❖ Residents are not aware of the evidence base which demonstrates that this testing is low-value and the resulting negative impacts that this can have on patient safety and patient experience;
- ❖ Residents place orders for the tests habitually/as part of the clinical routine;
- ❖ Residents place orders for the tests because they expect that a senior supervising colleague will want to see the results at ward rounds.

Next, the team selected strategies to overcome these barriers. They reviewed the ERIC Taxonomy and, through a series of discussions amongst the team and with members of the hospital senior management team, they selected and developed the following strategies:

- ❖ Conduct educational meetings: Continuing Professional Development (CPD) sessions were developed to introduce low-value care, provide evidence from the literature supporting reductions in repeat testing, and to specifically highlight the negative impacts of repeat testing on patients. These were targeted at all internal medicine staff types and CPD credits were provided where relevant.
- ❖ Remind clinicians: a best practice alert was embedded into the CPOE system used to order tests. So as not to contribute to alert fatigue, the alert only appeared in specific circumstances, i.e., when a complete blood count or electrolyte panel was selected and a normal result was available from the previous day for the patient in question. The alert was designed to remind physicians that the order could be low-value care resulting in negative impacts for the patient and to prompt physicians to consider un-selecting the tests on that basis. The default response option to close the alert was to un-select the test.
- ❖ Inform local opinion leaders: present the initiative to members of the hospital senior management team seen as influential to residents and their supervisors (i.e., Chief of Staff, Department Heads) and provide template text about the initiative that they can embed into their written and verbal communications with clinicians to make their support for the initiative explicit.
- ❖ Identify and prepare champions: recruit and train attending physician representatives from the Internal Medicine ward to support the initiative by discussing and explicitly supporting the initiative during ward rounds, clarifying that they do not want these tests to be ordered when not clinically needed, signposting to the educational meetings, being available to discuss and resolve any concerns raised, and spreading these messages amongst their attending colleagues.

The strategies were implemented over a 3-month period. An ITS analysis was used to assess the impact of the initiative on the target outcomes. For example: the number of electrolyte panels ordered per inpatient day was extracted from the Hospital Information System for each week for the 26 weeks (i.e., 6 months) before the initiative, and for the 26 weeks after the end of the 3-month implementation period. These data were plotted on a graph and an ITS analysis involving a segmented regression approach was used to assess whether there was an immediate and/or a more gradual impact of the initiative on test volumes.