Making Insulin Treatment Safer (MITS)

Final Report

Tim Dornan (Principal Investigator and author of this report) for the MITS Team, whose other members were Rosie Donnelly, Ciara Lee, Deborah Millar, Angela Carrington

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Funded by

HSC Public Health Agency
Research and Development

With additional support from

iNMED
IRISH NETWORK OF MEDICAL EDUCATORS

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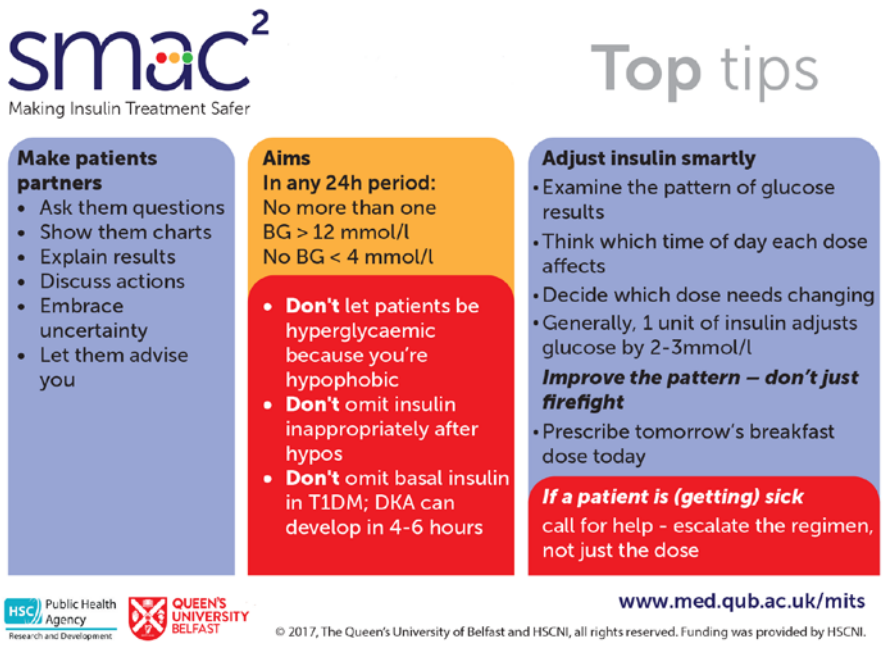

smac²
Making Insulin Treatment Safer

MITS Debriefer Training Booklet

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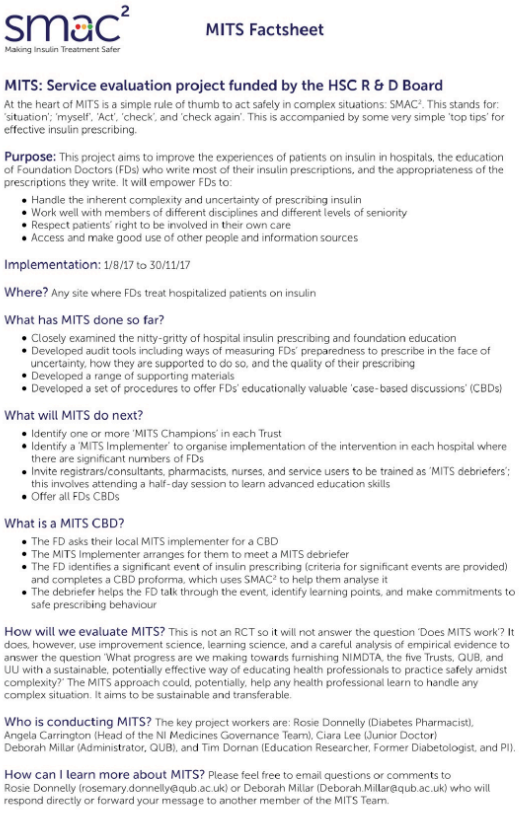

smac² Making Insulin Treatment Safer

MITS Factsheet

MITS: Service evaluation project funded by the HSC R & D Board

At the heart of MITS is a simple rule of thumb to act safely in complex situations: SMAC². This stands for: 'situation'; 'myself', 'Act', 'check', and 'check again'. This is accompanied by some very simple 'top tips' for effective insulin prescribing.

Purpose: This project aims to improve the experiences of patients on insulin in hospitals, the education of Foundation Doctors (FDs) who write most of their insulin prescriptions, and the appropriateness of the prescriptions they write. It will empower FDs to:

- Handle the inherent complexity and uncertainty of prescribing insulin
- Work well with members of different disciplines and different levels of seniority
- Respect patients' right to be involved in their own care
- Access and make good use of other people and information sources

Implementation: 1/8/17 to 30/11/17

Where? Any site where FDs treat hospitalized patients on insulin

What has MITS done so far?

- Closely examined the nitty-gritty of hospital insulin prescribing and foundation education
- Developed audit tools including ways of measuring FDs' preparedness to prescribe in the face of uncertainty, how they are supported to do so, and the quality of their prescribing
- Developed a range of supporting materials
- Developed a set of procedures to offer FDs' educationally valuable 'case-based discussions' (CBDs)

What will MITS do next?

- Identify one or more 'MITS Champions' in each Trust
- Identify a 'MITS Implementer' to organise implementation of the intervention in each hospital where there are significant numbers of FDs
- Invite registrars/consultants, pharmacists, nurses, and service users to be trained as 'MITS debriefers'; this involves attending a half-day session to learn advanced education skills
- Offer all FDs CBDs

What is a MITS CBD?

- The FD asks their local MITS implementer for a CBD
- The MITS Implementer arranges for them to meet a MITS debriefer
- The FD identifies a significant event of insulin prescribing (criteria for significant events are provided) and completes a CBD proforma, which uses SMAC² to help them analyse it
- The debriefer helps the FD talk through the event, identify learning points, and make commitments to safe prescribing behaviour

How will we evaluate MITS? This is not an RCT so it will not answer the question 'Does MITS work'? It does, however, use improvement science, learning science, and a careful analysis of empirical evidence to answer the question 'What progress are we making towards furnishing NIMDTA, the five Trusts, QUB, and UU with a sustainable, potentially effective way of educating health professionals to practice safely amidst complexity?' The MITS approach could, potentially, help any health professional learn to handle any complex situation. It aims to be sustainable and transferable.

Who is conducting MITS? The key project workers are: Rosie Donnelly (Diabetes Pharmacist), Angela Carrington (Head of the NI Medicines Governance Team), Ciara Lee (Junior Doctor) Deborah Millar (Administrator, QUB), and Tim Dornan (Education Researcher, Former Diabetologist, and PI).

How can I learn more about MITS? Please feel free to email questions or comments to Rosie Donnelly (rosemary.donnelly@qub.ac.uk) or Deborah Millar (Deborah.Millar@qub.ac.uk) who will respond directly or forward your message to another member of the MITS Team.

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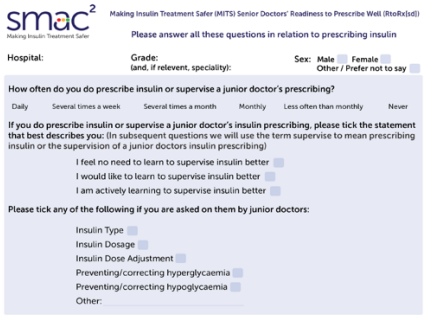
Annex 7. The Readiness to (Support) Prescribing Questionnaire for Senior Doctors



smac² Making Insulin Treatment Safer

Making Insulin Treatment Safer (MITS) Senior Doctors' Readiness to Prescribe Well (RtoRx[sd])

Please answer all these questions in relation to prescribing insulin

Hospital: Grade: (and, if relevent, speciality): Sex: Male Female Other / Prefer not to say

How often do you do prescribe insulin or supervise a junior doctor's prescribing?

Daily | Several times a week | Several times a month | Monthly | Less often than monthly | Never

If you do prescribe insulin or supervise a junior doctor's insulin prescribing, please tick the statement that best describes you: (In subsequent questions we will use the term supervise to mean prescribing insulin or the supervision of a junior doctors insulin prescribing)

- I feel no need to learn to supervise insulin better
- I would like to learn to supervise insulin better
- I am actively learning to supervise insulin better

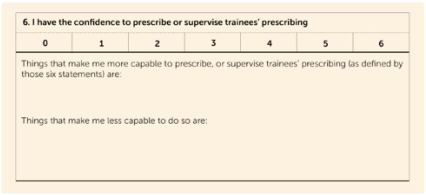
Please tick any of the following if you are asked on them by junior doctors:

- Insulin Type
- Insulin Dosage
- Insulin Dose Adjustment
- Preventing/correcting hyperglycaemia
- Preventing/correcting hypoglycaemia
- Other:

Please rate your agreement with the following statements **as they apply to insulin prescribing**. Circle a number from 0 (completely disagree) to 6 (completely agree). There are several places in the questionnaire where we invite you to add written comments. Whilst that is optional, please rate all the numerical items.

Your capability to prescribe insulin and supervise trainees' insulin prescribing

Completely Disagree						Completely Agree
1. I think out prescriptions logically rather than by habit						
0	1	2	3	4	5	6
2. I can distinguish simple prescribing decisions from difficult/ambiguous ones						
0	1	2	3	4	5	6
3. I can judge whether my knowledge and skills are sufficient for individual prescribing decisions						
0	1	2	3	4	5	6
4. When I recognize what action needs to be taken, I (advise a trainee how to) prescribe without hesitation						
0	1	2	3	4	5	6
5. I feel safe prescribing or supervising trainees' prescribing						
0	1	2	3	4	5	6

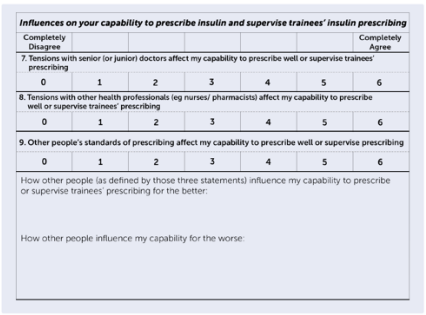


6. I have the confidence to prescribe or supervise trainees' prescribing

0	1	2	3	4	5	6

Things that make me more capable to prescribe, or supervise trainees' prescribing (as defined by those six statements) are:

Things that make me less capable to do so are:

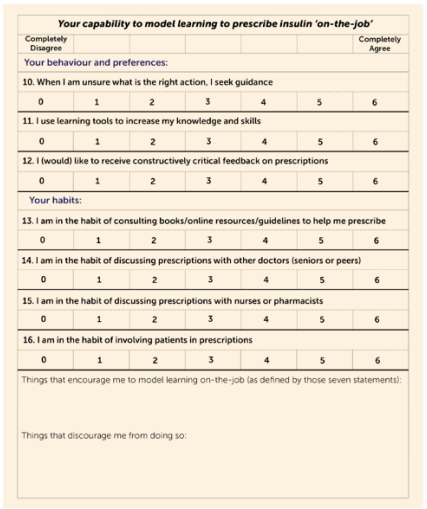


Influences on your capability to prescribe insulin and supervise trainees' insulin prescribing

Completely Disagree						Completely Agree
7. Tensions with senior (or junior) doctors affect my capability to prescribe well or supervise trainees' prescribing						
0	1	2	3	4	5	6
8. Tensions with other health professionals (eg nurses/ pharmacists) affect my capability to prescribe well or supervise trainees' prescribing						
0	1	2	3	4	5	6
9. Other people's standards of prescribing affect my capability to prescribe well or supervise prescribing						
0	1	2	3	4	5	6

How other people (as defined by those three statements) influence my capability to prescribe or supervise trainees' prescribing for the better:

How other people influence my capability for the worse:

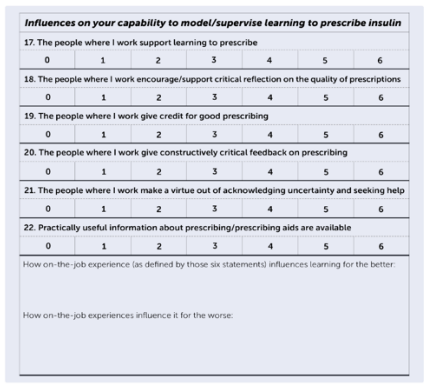


Your capability to model learning to prescribe insulin 'on-the-job'

Completely Disagree						Completely Agree
Your behaviour and preferences:						
10. When I am unsure what is the right action, I seek guidance						
0	1	2	3	4	5	6
11. I use learning tools to increase my knowledge and skills						
0	1	2	3	4	5	6
12. I (would) like to receive constructively critical feedback on prescriptions						
0	1	2	3	4	5	6
Your habits:						
13. I am in the habit of consulting books/online resources/guidelines to help me prescribe						
0	1	2	3	4	5	6
14. I am in the habit of discussing prescriptions with other doctors (seniors or peers)						
0	1	2	3	4	5	6
15. I am in the habit of discussing prescriptions with nurses or pharmacists						
0	1	2	3	4	5	6
16. I am in the habit of involving patients in prescriptions						
0	1	2	3	4	5	6

Things that encourage me to model learning on-the-job (as defined by those seven statements):

Things that discourage me from doing so:

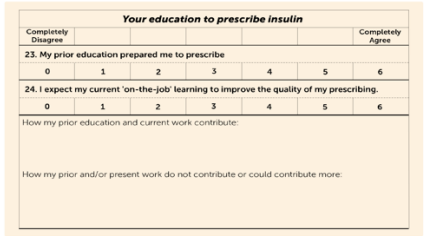


Influences on your capability to model/supervise learning to prescribe insulin

17. The people where I work support learning to prescribe						
0	1	2	3	4	5	6
18. The people where I work encourage/support critical reflection on the quality of prescriptions						
0	1	2	3	4	5	6
19. The people where I work give credit for good prescribing						
0	1	2	3	4	5	6
20. The people where I work give constructively critical feedback on prescribing						
0	1	2	3	4	5	6
21. The people where I work make a virtue out of acknowledging uncertainty and seeking help						
0	1	2	3	4	5	6
22. Practically useful information about prescribing/prescribing aids are available						
0	1	2	3	4	5	6

How on-the-job experience (as defined by those six statements) influences learning for the better:

How on-the-job experiences influence it for the worse:



Your education to prescribe insulin

Completely Disagree						Completely Agree
23. My prior education prepared me to prescribe						
0	1	2	3	4	5	6
24. I expect my current 'on-the-job' learning to improve the quality of my prescribing.						
0	1	2	3	4	5	6

How my prior education and current work contribute:

How my prior and/or present work do not contribute or could contribute more:

Executive summary

Evidence brief

Why did we start?

Insulin is a high-risk medication, the prescribing of which is an intractable threat to patient safety in UK hospitals. Seventy percent of insulin prescriptions are written by doctors within 2 years of qualification (Foundation Trainees; FTs), usually those within the first year after qualification. The rate of errors in their prescriptions is high. Patients' glycaemic control is poor and patients are less involved in their diabetes than some of them would wish. Insulin safety is not improving and attempts to improve it cause stress among doctors and other clinical staff, which can lead to burnout.

What did we do?

We used an implementation science approach. This approach simultaneously provides new knowledge about the systems and contexts you intend to change and about the tools you use to change these. Implementation science does not just produce knowledge. It produces tools and procedures that are fit for purpose to solve the problem at hand.

We developed audit tools. One tool audited patients' involvement in their own care and their glycaemic control. Another audited junior doctors' readiness to prescribe insulin. Others audited the readiness of pharmacists, nurses, and senior/middle-grade doctors to support FTs' prescribing, and professional leaders' views of insulin education.

We developed a novel set of pedagogic (educational) tools to improve doctors' learning and demonstrated their usefulness

What answer did we get?

The tools we had developed were fit-for-purpose. By using the tools, we went further than getting answers. We began a process of change. We also won one prestigious national award, were runners-up in a second prestigious national award, and received considerable acclaim from opinion leaders such as the UK Diabetes Tsar. This told us that our work was seen to be valuable further afield than Northern Ireland and was worth pursuing.

What should be done now?

- Use the tools across Northern Ireland and beyond to quality-improve doctors' education and patients' care whilst in hospital
    - Audit goals
        - Audit patients' experiences
        - Audit doctors' readiness
    - Educational goals
        - Educate all FTs in Northern Ireland using the SMAC^2 reflective tool, supported by debriefers trained using our procedures
        - Monitor their educational experiences and use these to make further improvements to the systems of clinical care and clinical education
    - Quality improvement goals
- We have provided a very detailed set of evidence-based recommendations to improve insulin safety; we ask professional leaders to implement the recommendations that can be implemented immediately at little or no cost, and plan to implement the recommendations that require longer-term planning.

Background[1]

Poor prescribing is one of the greatest causes of iatrogenic harm in hospitals. Harm occurs when prescribers make irrational, inappropriate, and ineffective choices of medications, underprescribe, overprescribe, write faulty prescriptions, and fail to alter therapy when needed.(1) About 10% of prescriptions in UK hospitals have errors and a third of patients are affected. Errors are becoming no less common despite all efforts to improve patient safety. (2–4)

This is a matter of concern for UK medical schools and deaneries because FTs (FTs), most of whom have graduated from those medical schools, write 70% of UK hospital prescriptions. The EQUIP study (5) showed that newly qualified doctors make prescribing errors because undergraduate curricula leave them unprepared to behave safely amidst the social complexity of workplaces. The knowledge and skills they lack are of a social and contextualised nature, rather than the type of knowledge that is tested in OSCEC and MCQ examinations.(5) Put simply, they are inexperienced.

It can be argued that efforts to improve patient safety have contributed to newly qualified doctors being unsafe. Healthcare providers are afraid of giving medical students, who have not yet finished training to be doctors, any responsibility. This results in doctors being inadequately trained when they enter practice – and therefore unsafe. Unsafe practice, which can probably never be completely eliminated, has simply moved up one layer in the lifelong learning continuum. The hypothesis that away-from-the-bedside education can produce safe, work-ready medical graduates is unproven.

The consequence is that the first two years of doctors' postgraduate education play a crucial role in prescribing education. Young doctors are gaining experience and developing habits of practice whilst caring for patients. Various factors mitigate against this being safe and effective. As Chantler put it (6) 'Medicine used to be simple, ineffective and relatively safe. It is now complex, effective and potentially dangerous.' Prescribing effective but potentially dangerous medications for patients in UK hospitals falls on the shoulders of FTs.

Although nominally trainees, foundation doctors are a vital part of the medical workforce, who work semi-independently. Rather than being closely supervised, meeting the demands of contemporary healthcare with scanty resources requires a 'division of labour' between senior doctors and junior doctors. A foundation trainee may prescribe a powerful drug like insulin whilst supervised by a senior who cannot themselves perform the task. Even if the supervisor is competent, there may be too little time for supervised practice and reflection. Shift-working, moreover, prevents prescribers knowing they have made errors because pharmacists correct minor errors themselves and refer more serious errors to the doctor on duty, rather than to the person who made the error.(3) Whilst this account is based on personal experience of UK hospitals, fragmentation of care is an international problem.(7) The system of work-based clinical education militates against learning safe prescribing.

Insulin is a potent drug with a narrow therapeutic window. It is hard to keep patients within the therapeutic window and it is possible for patients to move quickly out of the window in one direction or the other, and between the two extremes that lie outside the window. It is even harder to keep hospitalised patients within the therapeutic window because the effect of insulin depends on the exercise patients have taken and the foods they have eaten, which are disrupted by illness and hospital routines. Worse still, illness affects the body's sensitivity to insulin so the effect of any given insulin dose is much less predictable than when patients are well and leading their normal lives.

Overdosing causes hypoglycaemia, which alarms staff and patients and can cause lasting harm. Underdosing is, arguably, more dangerous. Moderate hyperglycaemia, resulting from underdosing, is insidious because patients may have no symptoms from it and staff may feel it is a safer state of affairs than risking hypoglycaemia. Yet insidious damage results, such as delayed

[1] More information is in the detailed report that follows this executive summary

wound healing. Moderate hyperglycaemia can progress to severe hyperglycaemia (ketoacidosis and the hyperglycaemic hyperosmolar non-ketotic state).

The conundrum of insulin therapy is that giving exactly the right dose of the right insulin at the right time is skilled work but it is so commonplace that the least experienced doctors, FTs, do most of it. They are rarely skilled, and skilled supervision is not readily available to them. It is easier, superficially safer, and yet in reality more dangerous to underdose than to overdose with insulin. Although hypoglycaemia is an alarming state of affairs, it is relatively unlikely to cause lasting harm in hospitalised patients, because a doctor or nurse is likely to notice that a deeply hypoglycaemic patient is unrousable before brain damage occurs. Severe hyerglycaemia, particularly in the sick elderly patients who occupy so many hospital beds, has a high mortality and patients may progress from moderate to severe hypoglycaemia so insidiously that the diagnosis is not made until it is too late. Yet hypoglycaemia, which is less dangerous, is so dramatic, and potentially blameworthy, that a state of 'hypophobia' leads to widespread underdosing. The culture of hospital practice, therefore, adds an extra layer of complexity.

One final layer of complexity is the relative expertise of patients and staff, and the thorny question of who exercises responsibility, and how, in hospital care. Diabetic patients, outside hospital, have to stay within the therapeutic window in order to 'have a life'. To a greater or lesser extent, they become experts on their own diabetes, and on diabetes in general. Admission to hospital is complex because they may be well enough, and expert enough, to manage their diabetes better than any doctor and nurse could ever do. But they may not be well enough and/or expert enough and, even if they are, the cultures and routines of hospitals may take tools they are expert at using out of their hands. Doctors and nurses, even if they would like patients to take responsibility for their own care, may worry about being blamed for doing so if something goes wrong, may not know how to do so, and may be unsure about the legitimacy (within the rules of clinical governance) of doing so. Patient involvement, vital though it is, is not straightforward.

Statistics confirm that there is room for improvement in insulin safety. An audit of UK practice has found a high rate of insulin errors, which has not improved over five consecutive years.(8) Hypoglycaemia, hyperglycaemia, and/or inadequate monitoring occur on four out of seven days and one in 25 patients develops ketoacidosis after admission.(8) The scale of this problem becomes clear when one considers that one in six United Kingdom (UK) hospital beds is occupied by a diabetic patient (8) and diabetes adds £1bn per annum to the cost of inpatient care. Such a high human and fiscal cost demands a solution.

About 70% of hospital prescriptions are written by FTs. We should not be surprised FTs make medication errors because they have consistently reported feeling underprepared, particularly for the sometimes difficult conditions in which they prescribe. (9–25) This unpreparedness can cause intense anxiety.(11,26) Insulin is a drug which FTs feel particularly unprepared to prescribe, although some medical schools and foundation programmes seem to prepare students better than others.(11) Better education and/or support of new medical graduates could make an important contribution to insulin safety.

Overall aims and objectives

Aim: Develop a way of helping FTs learn safer practice from their experiences of prescribing insulin.
Objectives: Deliver pedagogic and audit tools and recommendations to improve education for insulin safety

To achieve these aims and objectives, MITS had three workstreams, each with its own aims and objectives.

Workstream 1

Aim: Provide validity evidence for the concept of ‘readiness’ to prescribe
Objectives: Provide policymakers, researchers, educational leaders, practitioners and students with a valid instrument to audit readiness to prescribe

Workstream 2

Aim: Amplify the concept of 'readiness' by surveying other stakeholders in insulin prescribing.
Objectives:

- Use concepts and insights from workstream 1 to develop survey instruments
- Apply these to other stakeholders
- Analyse the findings and draw conclusions that could improve FTs' readiness to prescribe

Workstream 3

Aim: Develop, implement, and test the feasibility of using a novel pedagogy to improve FTs' insulin prescribing
Objectives:

- Use best theory, empirical evidence, and understanding of workplace education to develop a set of educational procedures that could be implemented in foundation education
- Implement this as widely as possible across Norther Ireland within the time constraints of our funding
- Evaluate the fitness for purpose of the pedagogy
- Identify facilitators of and obstacles to safer insulin prescribing

Methods[2]

Workstream 1

We reviewed all available evidence about how medical students and doctors are educated to prescribe and why they make prescribing errors. We reviewed education theory and behaviour change theory. We reviewed a number of possible methodologies to make and evaluate change.

From this review, we populated a spreadsheet relevant concepts that could be used in an audit questionnaire. We then piloted the questionnaire and progressively refined it. The final questionnaire had 20 items, which participants rated on 0-6 scales, evaluating their capability to prescribe their capability to learn to prescribe and the clinical environment in which they prescribed. The questionnaire also invited written comments.

Once we were satisfied with it, we asked an opportunity of 256 FTs to complete the questionnaire and used a combination of quantitative and qualitative research methods to test how the questionnaire had performed.

Workstream 2

Using concepts related to the ones used in Workstream 1, we developed questionnaires to evaluate pharmacists', nurses', and senior doctors' readiness to support FTs' prescribing. We also developed, using items from the National Diabetes Inpatient audit, an instrument to evaluate patients' glycaemic control, and their involvement in their own care. We used quantitative and qualitative methods to analyse these.

Workstream 3

We first tried to implement an existing solution to improve FTs' prescribing education but found it did not work in 'real-world' practice, despite having apparently been effective in a randomised controlled trial. We developed an entirely new 'pedagogy' (way of educating FTs). They used a reflective tool to analyse one or more personally meaningful experiences of prescribing insulin. By appointment, they met a trained 'debriefer', who helped them learn from this exercise and make commitments to more effective future behaviour. One hundred and thirteen FTs participated; 20% of all FTs in Northern Ireland, including 40% of FY1 trainees.

We developed a way of training debriefers using empowerment principles. Fifty-six doctors, pharmacists, and nurses volunteered to be trained. We took the novel step of training two service users with Type 1 diabetes, who conducted 10% of the debriefs.

We evaluated the intervention by analysing written records of the debriefs, and evaluating FTs' and debriefers' experiences.

[2] Exhaustive methodological details are contained in each of the three workstream reports

Personal and Public Involvement (PPI)

Service user involvement ran through every aspect of MITS. Service users helped develop the research question and design the study. They contributed to running the study as research participants and debriefers. They took an active part in disseminating the findings, which resulted in us being runners in the prestigious national patient safety awards.

MITS set out to increase FTs' readiness to involve patients actively in their own care and the findings of the study showed that it did so effectively.

Towards the end of MITS, a person with diabetes from Northern Ireland who is a well-known presenter on Radio 4 kindly came to Belfast to co-facilitate a service user engagement event. Over 50 people registered to attend, 18 of whom were service users. Fewer attended because of heavy snow but, despite adverse weather conditions, over 30 people participated.

Findings

Workstream 1

This workstream demonstrated the reliability and validity of a 'Readiness to Prescribe' audit questionnaire, which we showed to be usable and useful. It showed that participants were more likely to say they were capable of prescribing than that they were capable of learning to prescribe and they were least likely to say that the learning was supported. Tensions with the doctors who supervised them and the nurses with whom they work closely adversely affected the capability of 50% of participants. These undesirable features appeared to be of foundation education as a whole rather than of specific learning environments. The quantitative findings identified possibilities for improvement, most important of which is to foster a positive educational culture that values good prescribing, encourages constructive feedback, and learning, and promotes greater collaboration with fellow patients and professionals

Free text comments clarified some of the quantitative findings. Participants described an unreflective type of learning from experience in which they uncritically copied what others had done before and learned to 'get by' when faced with complex problems unsupported. Workload pressures, for example being presented with several prescription charts away from the bedside and being expected to prescribe quickly without assessing patients, coupled with pressure not to make patients hypoglycaemic, may have encouraged unreflective behaviour.

Workstream 2

Impact on patients

NaDIA target: Glycaemic control

Forty-three percent of patients had had no 'good diabetes days' and only 3% had had seven or more good days. Thirty percent had been hypoglycaemic. Control was no better in the subset of patients who had been in hospital 7 days or longer.

NaDIA target: Patient involvement

Thirty-five percent of participants said nobody had discussed their blood sugar reading with them in the preceding 24 hours and 39% said nobody had discussed their insulin dose.

The involvement of patients who were used to caring for themselves

Forty percent of patients who were on insulin before they were admitted to hospital were not making insulin dosing decisions. Thirty percent said nobody had discussed their blood glucose and 33% said nobody had discussed their insulin dosing. This suggests there is scope for greater involvement of patients and greater use of their expertise.

Different professions' attitudes towards patient involvement

Many pharmacists disagreed with the statement that they habitually involved patients, and few agreed strongly (Median 3, IQR 1-4) whereas most nurses and senior doctors agreed with it (Nurses: Median 5, IQR 3-6; Senior doctors: Median 5, IQR 3-5). One senior doctor said patients' expertise increased his/her capability to provide care. Some nurses' free text responses normalised and advocated involving patients and giving them responsibility, and said patients were a valuable

source of advice, provided they were fit enough. Despite rating their involvement of patients higher than pharmacists, only 50% of doctors and nurses agreed that they habitually involved patients.

FTs' education in diabetes management

Lack of proactivity

Our survey used the proportion of prescription charts that had a dose of insulin prescribed for the next morning as a marker of proactive diabetes management. Seventy percent of charts did not have this, which increased from 18% of patients audited before 3pm to 65% of patients audited after 3pm. We reasoned that patients who had been in hospital 7 days or longer and were audited in the afternoon were most likely to have insulin prescribed proactively. Still, 20% of charts had no morning insulin dose by the end of the working day.

There was other evidence of a lack of proactive diabetes management. Senior doctors noted that this problem existed, together with a lack of priority and a sense of urgency to prescribe insulin, and fixed ideas about how to prescribe it. Senior doctors cited unawareness of the consequences of hyperglycaemia, fear of hypoglycaemia, and fear of admitting their incapability to prescribe insulin.

Failure to manage diabetes proactively inevitably throws the responsibility for insulin prescribing onto staff working out of hours.

Out-of-hours

Nurse participants noted that their most important source of support – diabetes specialist nurses – was unavailable out-of-hours, when they (and, by inference, FTs) often needed support.

Interprofessional working in FTs' training milieu

Pharmacists were ready to support FTs' prescribing education. Those who were more knowledgeable and experienced were readier than less experienced colleagues, but the latter were reasonably well supported and ready to use this support and other information sources to increase their own capabilities.

Nurses were less ready to support FTs' learning and did not want to share responsibility for insulin prescribing. Nurses were ready, though, to make available their knowledge of individual patients, their experiential knowledge of insulin prescribing, and their knowledge of practice in their ward towards prescribing decisions. Good support from other nurses – particularly diabetes specialist nurses – made them readier to do this. Nurse participants did not routinely give feedback, and did not want to criticise prescribing disrespectfully, but were ready to intervene if they thought harm might result. Doctors' unreceptiveness inhibited nurses from making comments. Diabetes specialist nurses were a very valuable source of support, though this was unavailable out-of-hours.

The prescribing cultures in which FTs' learned

Positive cultures were characterised by seeking feedback and gratefully accepting it. In collegial professional groups, members of other professions were approachable and behaved non-hierarchically. This made it appropriate for FTs to ask for help and pharmacists to give it. Professionals who made a virtue of being uncertain encouraged other professionals to express uncertainty. Nurses' free text comments most strongly expressed a culture of recognising one's limits and asking for help.

Negative cultures were characterised by senior doctors not recognising FTs' work and being defensive towards pharmacists. A culture of blame and being unduly preoccupied with adverse incidents and complaints discouraged people from expressing uncertainty.

Asked specifically about prescribing, median ratings for agreement with the statement 'people give credit for good prescribing' were 2, IQR 0-3 (pharmacists) 3, IQR 1-5 (nurses) and 3, IQR 2-5 (senior doctors).

Culture of medical education

Senior doctors' ratings and free text comments placed strong emphasis on learning to prescribe from experience in supportive educational milieus, despite noting deficiencies in the milieus where they and FTs gain experience. They sought guidance from other doctors in preference to obtaining written information or discussing prescriptions with nurses, pharmacists, or patients. Being unduly busy and the absence of just-in-time information or guidelines decreased their

capability. Participants would have valued better training in the use of new insulins. Service leaders made positive comments about reflective learning, but senior doctors advocacy for learning from experience made little mention of the reflective component of experiential learning.

Workstream 3

MITS debriefs have provided examples of FTs managing challenging situation resourcefully and effectively. They have highlighted just how complex some situations are, in which FTs are expected to prescribe insulin – an archetypal high-risk medication – with limited support. Debriefs have shown, also, ways in which the system of diabetes care could serve patients, FTs, other doctors, nurses, pharmacists, and other health workers better.

This work stream has provided proof of concept for MITS. What was funded as a feasibility study succeeded in educating 22% of FTs in the Northern Irish healthcare system 40% of FY1s in all five Trusts. Even allowing for generosity bias, evaluation showed that participants found MITS CBDs educationally valuable.

Alongside FTs, MITS educated 58 pharmacists, doctors, nurses, varied widely in their seniority, and two service users conduct CBDs. Whilst uptake by debriefers was variable, at least some of them described it as a very acceptable and valuable pedagogy with some advantages over alternatives. Debrief is made numerous constructive suggestions to quality-improve MITS.

MITS was designed using leading contemporary behaviour change, education, and implementation theories and practices. It was also based on best available empirical evidence. Whilst this project was neither resourced nor designed to provide proof of patient benefit, there are good reasons to believe the intermediate outcomes that we were able to evaluate are valid.

FTs' commitments to involve patients more, collaborate more effectively with other workers, and make a range of changes in their clinical behaviour that would be expected to improve insulin safety are evidence that MITS had positive impact. In addition, the debriefs provided preliminary evidence that MITS is actually changing FTs' behaviour.

MITS fulfilled some recommendation of workstreams 1 and 2, reinforced those recommendations, and provided some additional recommendations. The findings of the three workstreams were remarkably complementary. Insulin safety could be improved by better availability of learning materials and guidelines, and greater awareness of these. By making diabetes care more proactive and less reactive. By encouraging professionals to view insulin treatment more positively: to be less fearful of its negative effect, hypoglycaemia, and keener to give patients the benefit of its positive effect, euglycaemia. By supporting front-line workers better and reducing interprofessional tensions. And by improving access to specialist advice, including out-of-hours.

Conclusions of workstream 3

MITS debriefs have provided examples of FTs managing challenging situation resourcefully and effectively. They have highlighted just how complex some situations are, in which FTs are expected to prescribe insulin – an archetypal high-risk medication – with limited support. Debriefs have shown, also, ways in which the system of diabetes care could serve patients, FTs, other doctors, nurses, pharmacists, and other health workers better.

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Deliverables, including policy and practice recommendations

MITS has designed new tools, which are ready for implementation at scale, and recommendations about how the system of diabetes workplace learning could be improved with the help of these and other tools.

Pedagogic tools

- The **SMAC^2 reflective tool and its presentation on a lanyard card with 'hot tips'** is a central component of MITS. (Annex 1 of the full report)
- A set of training procedures, educating professionals and service users to debrief FTs underpins the use of the **SMAC^2 heuristic** in case-based discussions. (Annex 2 of the full report)
- A set of **educational procedures for debriefers and FTs to co-participate in conducting reflective case-based discussions** is the means by which debriefers support FTs' education. (Also presented in Annex of the full report)

Audit tools

- The **'Readiness to Prescribe' questionnaire (RtPQ)** is a reliable and valid audit tool, which is ready for immediate use to quality-improve foundation education. Whilst it was developed for insulin prescribing, it is transferable to other prescribing tasks, and potentially non-prescribing tasks (Annex 3 of the full report)
- A simple **tool to audit patients' involvement in care**. Since it is compliant with the National Diabetes Inpatient Audit, it has high face validity. (Annex 4 of the full report)
- **Other audit tools** that proved useful and could be reviewed, revised, used for audit purposes, and further improved in light of psychometric analysis. (Annexes 5-8)
- **A record sheet on which debriefers keep records of case-based discussions,** which proved to be a powerful audit tool, identifying factors that influence FTs' insulin safety education (See Annex 2, page 10)
- An **online survey tool,** which provided useful information about FTs' experiences of MITS (Annex 9).

Recommendations for improving insulin safety (education)

By triangulating between the findings of three different workstreams, each of which used rigorous research procedures, MITS generated a set of recommendations for improving insulin safety (education). These are compatible with best educational theory, empirical evidence, and practice as exemplified by the system of Health and Social Care it operates in Northern Ireland.

Pedagogic recommendation

- We recommend that NIMDTA and the HSCNI Trusts implement MITS, using the tools delivered by us to implement and evaluate it

Quality improvement recommendations

Could be made immediately without additional resources

Encouraging:

- Current FTs to learn from the commitments to behaviour change which their peers made in the feasibility stage of MITS (Table 5).
- Pharmacists to give feedback to FTs as part of their routine practice
- FTs to involve patients more in prescribing decisions
- All professionals involved in insulin management to manage patients proactively, rather than postpone prescribing decisions for others to make out-of-hours
- Diabetes professionals to promote wider use of well-designed guidelines, charts, and other tools that support good practice
- Senior doctors, nurses, and pharmacists to ensure all relevant guidelines are readily accessible on all wards and encouraging all staff to make greater use of these
- Providers of off-the-job foundation education to teach FTs about insulins and their safe use
- FTs to find out what happened to patients whose insulin prescribing decisions were difficult or otherwise significant
- A reflective approach to learning from experience that:
    - Questions and improves upon other people's actions rather than uncritically replicates these
    - Encourages active and critical information-seeking, as opposed to seeking and uncritically following advice
- Senior and middle-grade doctors (including educational supervisors), pharmacists, nurses, and service users to help FTs make changes they have committed to, and changes listed in table X

Could be made immediately with relatively modest additional resources

- Educate health professionals (supervisors, pharmacists, and nurses) to have educative conversations that highlight FTs' existing capabilities and make constructive suggestions for improving their capabilities (Constructive feedback)
- Use RtPQ to audit and quality-improve FTs' prescribing education, and further improve RtPQ in light of further experience
- Increase pharmacists' support of FTs' prescribing education
- Use the patient involvement tool to audit and improve this aspect of diabetes care

Longer-term changes with greater resource implications

- Involve DSNs more in inpatient insulin prescribing
- Educate pharmacists to be more actively involved in insulin prescribing and FTs' education
- Provide greater support from one or more sources to out-of-hours insulin therapy

Changes in prescribing cultures

- Promoting a more positive attitude towards patient involvement
- Encouraging a more reflective approach to prescribing amidst the unavoidable pressures of contemporary NHS practice
- Encouraging a more positive attitude towards insulin, which emphasises its benefits as well as its risks
- Behaving supportively support towards front-line staff to reduce their stress and encourage them to collaborate with greater understanding of each other

Future, targeted, research

This should clarify, for example:

Why:

- Tensions exist between FTs, nurses, and senior doctors
- Hypophobia is so widespread and how this could be alleviated
- FTs are reluctant or unable to obtaining help and advice when confronted with complex problems

- Prescribing cultures vary between different clinical units

How:

- Insulin safety education can increase FTs' readiness to prescribe effectively by means other than the preceding ones

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Acknowledgements

We thank the doctors, nurses, pharmacists, managers, and educators who participated in MITS in various capacities – particularly as learners, debriefers - for their support. We thank the members of the Supervisory Board, named below, for the time and energy they invested. We thank Clive Wolsley for being so amenable and supportive. Lucie Byrne-Davies and Jo Hart gave us invaluable help with behaviour change aspects of the study and Noleen McCorry directed us towards the work of Damschroder, which provided vital underpinnings. Martin Adams and Roberta McCulloch provided the invaluable perspective of people with diabetes as debriefers and in disseminating MITS. JP Devlin made a heroic journey through the snow to attend our engagement event, which made all the hard work worthwhile.

Funded by

HSC Public Health Agency
Research and Development

With additional support from

iNMED
IRISH NETWORK OF MEDICAL EDUCATORS

Introduction

Origins

MITS, the Making Insulin Treatment Safer project, was funded by a knowledge exchange grant from the Research and Development Division of the Public Health Agency of the Northern Ireland Health and Social Care Board (HSCNI R&D). A research and development team in the Centre for Medical Education (CME), Queens University Belfast (QUB) led MITS and all 5 Health and Social Care (HSC) Trusts, Northern Ireland contributed. The Northern Ireland Medical and Dental Training Agency (NIMDTA) supported MITS, whose aim was to benefit patients by influencing foundation trainees' (FTs') workplace learning. Detailed aims and objectives are presented later.

Nature and values of MITS

This was not an effectiveness study. Rather it aimed to generate new information as a by-product having impact, rather than the more usual reverse situation, typified by translating randomized controlled clinical trials into evidence-based practice. Previous studies have consistently shown that pharmacist-led interventions can change doctors' behaviour so pharmacists had a prominent role. MITS also had a strong emphasis on patient involvement since diabetes is, *par excellence*, a disease where 'the patient is their own doctor'.

Timeline

HSCNI R&D confirmed funding in June 2016 but agreed a gap between then and the start of the project in December 2016 so that a project worker could be in post when funding began and to allow TD to review underpinning empirical evidence and theory. The Heads of Pharmacy of the five Trusts played a key role in initiating MITS by granting governance approval at directorate level. The Head of Pharmacy of South-Eastern Trust (Jill Macintyre), in particular, took a lead role by arranging for the main project worker to be interviewed and appointed in September 2016 and contributing actively to the MITS Supervisory Board.

Additional funding

When it became apparent that MITS needed a junior doctor as a project worker, we bid to the Irish Network for Medical Education (INMED), which generously awarded a grant of €1500. This allowed Ciara Lee to join the team.

The personnel

The 'MITS Team' implemented the project.

Table 1: Members of the core 'MITS team'

Name	Discipline	Position	Role in MITS	Funding
Tim Dornan	Medicine	Former diabetes specialist, education researcher, and expert in workplace learning	Principal Investigator	HSCNI & QUB
Rosie Donnelly	Pharmacy	Grade 8a pharmacist with special expertise in diabetes	Project field worker	HSCNI
Ciara Lee	Medicine	Junior doctor on career break	Project field worker	HSCNI & INMED
Deborah Millar	Business Studies	Research and development administrator	Project administrator	QUB
Angela Carrington	Pharmacy	Medicines Governance Pharmacist and head, NI medicines governance team	Project field worker	HSCNI

A Supervisory Board had oversight of MITS.

Table 2. Membership of MITS Supervisory Board

Name	Discipline	Position
Angela Carragher	Surgery	Consultant Surgeon and Lead of Foundation Education, NIMDTA
Vivien Coates	Nursing	Professor of Nursing Research, Ulster University
Jill Macintyre	Medicine	Head of Pharmacy, South-Eastern HSC Trust
David McCance	Medicine	Professor, QUB, and Consultant Endocrinologist, Belfast HSC Trust
Florence Findlay-White	Nursing	Former Diabetes Specialist Nurse and National Care Adviser, Diabetes UK
Roy Harper	Medicine	Consultant Endocrinologist, South-Eastern HSC Trust
Mary Tully	Pharmacy	Reader in Pharmacy Practice, University of Manchester

As MITS progressed, many other people contributed. For example, each Trust nominated a MITS Champion and a MITS implementer. Foundation programme leads, based in Trusts, supported implementation. Many diabetes healthcare professionals and two service users trained as 'MITS debriefers'. Other service users helped disseminate MITS.

The work

Wehrens (27) has criticised an assumption inherent in the term 'Knowledge Exchange', that there is an exchange of knowledge between producers and consumers of knowledge. MITS almost immediately came to the same conclusion. The knowledge produced by a randomised trial did not translate cleanly into action within the user community, and the user community provided vital knowledge which reshaped our intended intervention and made it fit for purpose. This 'messy engagement of multiple players with diverse sources of knowledge' (28) conformed better to 'knowledge interaction' and gave the MITS team the roles of 'knowledge intermediators', which produced new and more practically useful knowledge. As a result of this, MITS produced typical outputs (28) of knowledge interaction:

- Knowledge about the scale, source, and structure of the problem we intended to address
- Practical knowledge to support implementation
- Insights into relationships between values and policy directions

MITS was 'a creative and unfolding process', which challenged the status quo rather than being constrained by it. MITS did not produce 'stable acontextual knowledge' (28); it produced contextualised, transferable knowledge as well as direct impact on the implementation context.

This report

This report first goes deeper into the background to MITS from theoretical, empirical, and experiential perspectives. It redefines the aim of the work and then describes MITS' three main workstreams. A final section summarises the findings, draws conclusions and presents the deliverables and evidence of impact.

Background

Prescribing education – a wicked problem

Poor prescribing is one of the greatest causes of iatrogenic harm in hospitals. Harm occurs when prescribers make irrational, inappropriate, and ineffective choices of medications, underprescribe, overprescribe, write faulty prescriptions, and fail to alter therapy when needed. (1) About 10% of prescriptions in UK hospitals have errors and a third of patients are affected. Errors are becoming no less common despite all efforts to improve patient safety. (2–4)

This is a matter of concern for UK medical schools and deaneries because FTs (FTs), most of whom have graduated from those medical schools, write 70% of UK hospital prescriptions. The EQUIP study (5) showed that newly qualified doctors make prescribing errors because

undergraduate curricula leave them unprepared to behave safely amidst the social complexity of workplaces. The knowledge and skills they lack are of a social and contextualised nature, rather than the type of knowledge that is tested in OSCEC and MCQ examinations. (5) Put simply, they are inexperienced.

It can be argued that efforts to improve patient safety have contributed to newly qualified doctors being unsafe. Healthcare providers are afraid of giving medical students, who have not yet finished training to be doctors, any responsibility. This results in doctors being inadequately trained when they enter practice – and therefore unsafe. Unsafe practice, which can probably never be completely eliminated, has simply moved up one layer in the lifelong learning continuum. The hypothesis that away-from-the-bedside education can produce safe, work-ready medical graduates is unproven.

The consequence is that the first two years of doctors' postgraduate education play a crucial role in prescribing education. Young doctors are gaining experience and developing habits of practice whilst caring for patients. Various factors mitigate against this being safe and effective. As Chantler put it. (6) 'Medicine used to be simple, ineffective and relatively safe. It is now complex, effective and potentially dangerous.' Prescribing effective but potentially dangerous medications for patients in UK hospitals falls on the shoulders of FTs.

Although nominally trainees, foundation doctors are a vital part of the medical workforce, who work semi-independently. Rather than being closely supervised, meeting the demands of contemporary healthcare with scanty resources requires a 'division of labour' between senior doctors and junior doctors. A foundation trainee may prescribe a powerful drug like insulin whilst supervised by a senior who cannot themselves perform the task. Even if the supervisor is competent, there may be too little time for supervised practice and reflection. Shift-working, moreover, prevents prescribers knowing they have made errors because pharmacists correct minor errors themselves and refer more serious errors to the doctor on duty, rather than to the person who made the error. (3) Whilst this account is based on personal experience of UK hospitals, fragmentation of care is an international problem. (7) The system of workbased clinical education militates against learning safe prescribing.

The adjective 'wicked' was coined to describe problems in mathematics, chess, or puzzle solving that are difficult or impossible to solve because of incomplete, contradictory, and changing requirements that are difficult to recognize. (29) They are insoluble because they are, in reality, a nexus of interconnected problems, in open and constantly changing systems. Wicked problems are not amenable to quick solutions that seem to make sense because solving indeterminate problems requires a deep understanding of them, which requires time, open-mindedness, perhaps unsuccessful attempts to solve them, and deep reflection. (30)

MITS is a response to the wicked challenge of education for prescribing safety.

Insulin – a wicked prescription

Safety theorist, James Reason, proposed a 'three bucket' theory of error. (31) According to this, the probability of unsafe acts results from the amount of bad stuff in three buckets: the self, the context, and the task. We chose insulin prescribing as our bucket because it has about as much bad stuff in it as any healthcare bucket could contain. That meant it was well worth solving. And we speculated that a way of improving insulin safety could help solve other wicked, safety-critical problems in healthcare.

Insulin is a potent drug with a narrow therapeutic window. It is hard to keep patients within the therapeutic window and it is possible for patients to move quickly out of the window in one direction or the other, and between the two extremes that lie outside the window. It is even harder to keep hospitalised patients within the therapeutic window because the effect of insulin depends on the exercise patients have taken and the foods they have eaten, which are disrupted by illness and hospital routines. Worse still, illness affects the body's sensitivity to insulin so the effect of any given insulin dose is much less predictable than when patients are well and leading their normal lives.

Overdosing causes hypoglycaemia, which alarms staff and patients and can cause lasting harm. Underdosing is, arguably, more dangerous. Moderate hyperglycaemia, resulting from underdosing, is insidious because patients may have no symptoms from it and staff may feel it is a safer state of affairs than risking hypoglycaemia. Yet insidious damage results, such as delayed wound healing. Moderate hyperglycaemia can progress to severe hyperglycaemia (ketoacidosis and the hyperglycaemic hyperosmolar non-ketotic state).

The conundrum of insulin therapy is that giving exactly the right dose of the right insulin at the right time is skilled work but it is so commonplace that the least experienced doctors, FTs, do most of it. They are rarely skilled, and skilled supervision is not readily available to them. It is easier, superficially safer, and yet in reality more dangerous to underdose than to overdose with insulin. Although hypoglycaemia is an alarming state of affairs, it is relatively unlikely to cause lasting harm in hospitalised patients, because a doctor or nurse is likely to notice that a deeply hypoglycaemic patient is unrousable before brain damage occurs. Severe hyerglycaemia, particularly in the sick elderly patients who occupy so many hospital beds, has a high mortality and patients may progress from moderate to severe hypoglycaemia so insidiously that the diagnosis is not made until it is too late. Yet hypoglycaemia, which is less dangerous, is so dramatic, and potentially blameworthy, that a state of 'hypophobia' leads to widespread underdosing. The culture of hospital practice, therefore, adds an extra layer of complexity.

One final layer of complexity is the relative expertise of patients and staff, and the thorny question of who exercises responsibility, and how, in hospital care. Diabetic patients, outside hospital, have to stay within the therapeutic window in order to 'have a life'. To a greater or lesser extent, they become experts on their own diabetes, and on diabetes in general. Admission to hospital is complex because they may be well enough, and expert enough, to manage their diabetes better than any doctor and nurse could ever do. But they may not be well enough and/or expert enough and, even if they are, the cultures and routines of hospitals may take tools they are expert at using out of their hands. Doctors and nurses, even if they would like patients to take responsibility for their own care, may worry about being blamed for doing so if something goes wrong, may not know how to do so, and may be unsure about the legitimacy (within the rules of clinical governance) of doing so. Patient involvement, vital though it is, is not straightforward.

Statistics confirm that there is room for improvement in insulin safety. An audit of UK practice has found a high rate of insulin errors, which has not improved over five consecutive years. (8) Hypoglycaemia, hyperglycaemia, and/or inadequate monitoring occur on four out of seven days and one in 25 patients develops ketoacidosis after admission. (8) The scale of this problem becomes clear when one considers that one in six United Kingdom (UK) hospital beds is occupied by a diabetic patient (8) and diabetes adds £1bn per annum to the cost of inpatient care. Such a high human and fiscal cost demands a solution.

About 70% of hospital prescriptions are written by FTs. We should not be surprised FTs make medication errors because they have consistently reported feeling underprepared, particularly for the sometimes difficult conditions in which they prescribe. (9–25) This unpreparedness can cause intense anxiety. (11,26) Insulin is a drug which FTs feel particularly unprepared to prescribe, although some medical schools and foundation programmes seem to prepare students better than others. (11) Better education and/or support of new medical graduates could make an important contribution to insulin safety.

Improving patient safety: the person or the system?

Senge, who coined the term 'a learning organisation', argued that the vitality of organisations depends on several disciplines, which allow them to learn and thereby improve. (32) These include 'personal mastery', ‘a shared vision’, ‘team learning', and ‘mental models’. Central to his thinking is a concept that Senge described as 'the fifth discipline’ of learning organisations: 'systems thinking'. A healthcare quality improvement (QI) approach to patient safety exemplifies systems thinking. It aspires to assure safe, effective, patient-centred, timely, efficient, and equitable care by changing provider behaviour and organisation through using a systematic change method and strategies. Key

components of QI include understanding problems; understanding processes and systems within organisations; and choosing tools to bring about change.

Ironically, medical education has moved in a more or less opposite direction from QI. A regulatory and professional response to infamous examples of unsafe patient care has made individuals increasingly accountable for their actions. The professionalism movement in education, which seeks to identify individual learners' or practitioners' lack of professionalism and remediate these, is one example. Competency-based education, which identifies the competences that doctors should have, inculcates these in a variety of ways, and then tests that individuals possess these competencies, is another example. So, for example, Senge's 'team learning' is tested at an individual rather than collective level, which is the opposite of 'systems thinking'. The UK Prescribing Safety Assessment, (PSA) which students sit before they start foundation training, is another one. This tests individuals' ability to demonstrate the type of knowledge that can be taught and reliably tested in simulated settings. Its ability to improve patient safety is unproven.

So, the patient safety movement's two main arms – QI and medical education – take different positions. QI is systemic whilst medical education is individualistic. This individualistic approach is at odds with the notion of excellent healthcare being essentially systemic and collaborative and at odds with patient involvement and interprofessionalism, both of which require systemic rather than individualistic orientations. There are limitations, also, to QI's systematicity because having local ownership of problems and finding solutions within the individual contexts of individual institutions limits their transferability to other people, places, and systems. We hypothesised that bringing together QI's focus on systems with the best ideas from medical education for preparing individuals to work within those systems could improve insulin safety. This, however, required an entirely new approach to education.

Aim

Develop a way of helping FTs learn safer practice from their experiences of prescribing insulin.

Workplan

Original objectives

The objectives, for which MITS was funded were to: 1) help FTs learn from insulin errors; 2) give patients a greater part in their own care; 3) develop a package, which could be sustained in the future.

Early change of scope

MITS was funded as a knowledge exchange project, which aimed to implement the positive findings of a randomised controlled trial (RCT) conducted elsewhere. This had improved the safety of antibiotic prescribing by giving FTs feedback on errors and conducting small group education sessions where a trained pharmacist empowered them to commit to safer behaviour in future.(McLellan) Almost immediately after starting the MITS fieldwork, we found that insulin errors was so hard to define that, despite this being a 'state-of-the-art' approach to foundation education,(RCP) it was not feasible. Moreover, we found that running group sessions for FTs was impracticable because of their work intensity. Finally, we found that FTs and medical students were demoralised by the relentless emphasis on error and harm. For those reasons, we had to redesign the project.

This, we realise in retrospect, is a well-described problem with knowledge exchange projects. A chasm exists between scientific research and practice, which confounds the transfer of knowledge, as a commodity, between communities. (27) We therefore adopted a co-production approach, according to which practice advises science and policy every bit as much as science and policy inform practice. Within a co-production model, academics and practitioners use their different perspectives and competencies to coproduce knowledge about a complex problem or phenomenon that exists

under conditions of uncertainty found in the world'. (27) Science, policy, and practice were well represented in MITS so a switch to co-production was simple.

Workstreams

We set out to redesign the intervention, retaining its fundamental principles, but repackaging them for real educational practice, as opposed to an RCT. The corollary of not being able to give feedback on errors because they were so hard to define was that we also had to develop different ways of evaluating the project. We began by reviewing theory and evidence to theorise a method of educating FTs that went beyond the state-of-the-art. Once that was completed, the empirical part of MITS had three work streams. One explored FTs' readiness to prescribe insulin. A second stream explored the position of other stakeholders in which FTs' educational milieu. A third stream progressively refined and then implemented a form of education that we hoped would increase their readiness. In keeping with the original plan, an important thread that ran through MITS was increasing diabetic patients' involvement in their own care whilst in hospital. Co-production was well-suited to doing this because it 'intertwines the cognitive, material, social, and normative'. (27) Our scientific knowledge was only one contribution to the project. Material, social, and normative contributions of practitioners and patients were every bit as important.

Theorising a new approach to prescribing education

Three theories underpin the research. Billett's mutual interdependence theory (33) supports our assumption that readiness to prescribe is neither solely an individual attribute nor a feature of practice environments but an interaction between the two, each strengthening or weakening the other.

We took it as an axiom that education should lead to safe behaviour, not just a state of mind, so we chose Michie and colleagues' Capability-Opportunity-Motivation-Behaviour (COM-B) theory to guide the development of the scale. (34) According to this, learners adopt desired prescribing behaviours when they are motivated to do so. There are two types of motivation: reflective (conscious) motivation and automatic motivation (habit). Learners are motivated by being psychologically capable to (learn to) prescribe safely, and having physical and social opportunities to do so. The theory allows for interactions between behaviour, motivation, capability, and opportunity. Favourable learning environments, for example, make learners more capable and vice versa. This interdependence makes COM-B compatible with Billett's theory.

Damschroder and colleagues' Consolidated Framework for Implementation Research (CIFR) (35) provides empirically grounded constructs that, at a systems level, predict adoption of interventions. Some components of this framework are related to COM-B constructs (for example, self-efficacy in CIFR is related to reflective motivation in COM-B) and other constructs complement COM-B. These three theories provided, together, a set of theoretically and empirically valid constructs to underpin the measurement of readiness.

Research ethics and governance

MITS was a quality improvement project. The Heads of Pharmacy of the five Trusts gave governance approval at directorate level. We applied for QUB research ethics approval to conduct research using evaluation tools developed for MITS. The committee judge that only the Readiness to Prescribe questionnaires was subject to research ethics approval. They did not require verbal, written consent but asked us to include an information cover-sheet. After minor modifications, they gave ethics approval (approval number 17.33v3).

Workstream 1
Developing an instrument to operationalise readiness to prescribe
Introduction

The type of education medical schools typically provide goes some way to explaining unpreparedness, and the errors that results from this. In jurisdictions where medical students are not legally allowed to prescribe, curricula focus mainly on acquiring knowledge and skills 'off-the-job'. (25) This led, in one study, to only 25% of graduates rating themselves as well-prepared to **prescribe safely** whilst 50% of the same group of graduates felt well-prepared to **write prescriptions.**(36) Being able to write prescriptions well off-the-job does not guarantee safe prescribing because it is the complexity of situated prescribing that causes errors.(4,5) Induction programmes and assistantships make the transition from off-the-job learning in medical school to on-the-job learning after qualification less stressful (18,26) but there is little evidence these improve prescribing safety.(20) Undergraduate education, alone, seems unlikely to assure insulin safety.

Evidence does, however, support education after qualification. Diabetes specialist nurses who had more on-the-job experience of insulin therapy were better prepared to prescribe than less experienced practitioners who had received equivalent training. (13) Theorists have consistently argued that professional learning is heavily dependent on work experience. (37) Newly qualified doctors' on-the-job seems a more promising target for improvement efforts.

The transition from being a medical student who is not legally allowed to prescribe and protected from workplace pressures to an FT who does most prescribing and is fully exposed to those pressures is, however, an abrupt one. Being supported by other clinical staff, notably collaborating with pharmacists, eases the transition. (16) With or without that support, confidence rises quickly so that, within just 8 months of qualifications, 60% of FTs report feeling confident to prescribe insulin independently. (38) FTs' confidence is not always, however, matched by their competence. They do not always put the knowledge and skills they learned in medical school into practice, they sometimes use guesswork to guide their prescribing, and they do not always check the accuracy of their prescriptions. (12) This conforms alarmingly well to a wry definition of clinical experience as 'making the same mistakes with increasing confidence over an impressive number of years'. (39) Available evidence shows that doctors' early work-based preparation for safe practice is an important target for improvement efforts.

A recent literature review concluded that preparedness is a relevant concept but there is a lack of definitions and reliable means of evaluating this. (13) Moreover, well theorised, recent research discourages thinking of preparedness as an attribute of learners that can be fully acquired at any fixed point in their career. Rather, preparation is a continuing – indeed, lifelong - interaction between learners' attributes and the material and social environments in which they work and learn. (16,34) Since many patients would not receive drugs if only fully prepared doctors were allowed to prescribe them, this article uses the term 'readiness', which implies a willingness to act appropriately, which could mean either prescribing, or admitting unpreparedness and asking someone more senior to help. 'Readiness' emphasises the temporal and social dimensions of workplace learning as well as the emotional and practical aspects of being ready to work.

Since some learning environments tolerate uncertainty and support inexperienced practitioners better than others, we postulated that learners' readiness to act safely is in a two-way relationship with their learning environments' readiness to support their safe practice. This led us to define the term 'readiness' as 'a multi-dimensional construct, which includes learners' capability and motivation to carry out prescribing (and other safety-critical tasks) within the opportunities provided by, and constraints of, the contexts in which they are learning to practise'.

Operationalising readiness

Society places patient safety high on the policy agenda and insulin therapy causes much iatrogenic harm so conceptualising and defining the construct is insufficient. We set out to operationalise 'readiness'. We reasoned that the goal should be to obtain information that could

simultaneously support the quality-improvement of doctors' education, help develop their learning environments, and shed light on the concept of readiness. In order to do this, we developed an evaluation instrument. Two previous instruments have been described, one for foundation doctors (19) and one for medical students. (17) Neither was theorised and only one was psychometrically validated. Both defined preparedness in terms of the teaching and training learners had received rather than what graduates had learned and as an outcome rather than a process. To advance the field beyond these earlier scales, we identified strong theories and evidence that could guide us towards relevant constructs and chose a mixed-methods design both to evaluate readiness quantitatively and explore learners' experiences.

Aim of Workstream 1

Our aim was to provide validity evidence for the concept of readiness, as conceptualised by us and operationalised by the instrument. The objective was to provide policymakers, researchers, educational leaders, practitioners and students with a valid instrument that could help them co-produce ready learners in ready learning environments.

Methods

Study design, recruitment, and participants

Participants were FTs, learning during 4-6 month hospital placements, including medicine, surgery, a range of other secondary and tertiary care specialties, and general practice. This was a survey, in which all FTs were eligible to participate without any exclusion criteria, with the goal of recruiting as many FTs from all five Trusts as possible. Involving FTs in anything other than clinical duties proved difficult, however, as evidenced by poor attendance at hospital teaching events, even when these were nominally compulsory. Recruitment remained low despite team members assiduously attending hospital teaching session and emailing FTs. In light of this, we recruited at regional quality improvement teaching, which is mandatory, and attended by second year FTs from all Trusts. A team member briefly explained the study during a drinks break or at the end of the session and non-coercively invited FTs to complete the instrument. She did not stand over them as they completed it, and the form required no personal details. The teaching sessions were not directly related to insulin safety.

Instrument

Conceptual orientation

Three theories underpin the instrument. Billett's mutual interdependence theory (23,33) supports our assumption that readiness to prescribe is neither solely an individual attribute nor a feature of practice environments but an interaction between the two, each strengthening or weakening the other. We took it as an axiom that education should lead to safe behaviour, not just a state of mind, so we chose Michie and colleagues' Capability-Opportunity-Motivation-Behaviour (COM-B) theory to guide the development of the scale.(34) According to this, learners will adopt desired prescribing behaviours when they are motivated to do so. There are two types of motivation: reflective (conscious) motivation and automatic motivation (habit). Learners are motivated by being psychologically capable to (learn to) prescribe safely and having physical and social opportunities to do so. The theory allows for interactions between behaviour, motivation, capability, and opportunity, such as favourable learning environments making learners more capable and vice versa. This interdependence makes COM-B compatible with Billett's theory. Damschroder and colleagues' Consolidated Framework for Implementation Research (CIFR) (35) provides empirically grounded constructs that, at a systems level, predict adoption of interventions. Some components of this framework are related to COM-B constructs (for example, self-efficacy in CIFR is related to reflective motivation in COM-B) and other constructs complement COM-B. These three theories provided, together, a set of theoretically and empirically valid constructs to underpin the measurement of readiness.

Source of items

Whilst Billett's theory (33) provided high-level support for including contextual as well individualistic constructs in a measure of preparedness, it did not directly provide items. COM-B and CIFR did, however, provide items. We transcribed all relevant constructs from both theories into an Excel (Microsoft, Redmond USA) spreadsheet. In addition, we reviewed Reason's theory of error causation (40) and empirical research into the causes of FDs' prescribing errors (4,41) for additional constructs. The research team, whose members comprised a medicines governance pharmacist, a diabetes specialist pharmacist, a junior doctor, a senior doctor, and a lay member (administrator) clustered the items thematically and progressively reduced them to a comprehensive set of items that had no obvious redundancy.

Instrument design, iterations, and the finished instrument

Numerical items

The first version was a 25-item questionnaire, which asked participants to rate their agreement with short statements on anchored Likert scales. The final questionnaire reported here was the product of numerous phases of piloting and revising. After three rounds of revision within the team, a version four was piloted with a small group of FDs. Having obtained evidence of face validity and acceptability from their responses, we asked the Regional Head of Foundation Education to comment on and approve the questionnaire. After further minor revisions, we distributed the questionnaire and obtained responses from 179 FDs. Using SPSS Version 25 (IBM, USA), Bartlett's Test showed ($p<0.001$) we had sufficient responses to carry out an exploratory principal components analysis. This computed a four-factor solution with acceptable reliability but showed that one item had low loadings, due to ambiguous wording. We excluded the invalid item, examined the wording of all other items for ambiguity, and slightly reworded one to produce a set of 24 Likert items (Version 8). A further 87 participants completed the revised questionnaire. We then repeated the statistical analyses and eliminated one item that did not load onto any factor. There were three others whose 'alpha if deleted' values were above the alpha coefficient for the factor they loaded onto, which we also deleted. We report the psychometric properties of version 9, shown in Appendix 1, which has 20 items.

Free text items

Version 4 invited participants to add free text comments explaining all 25 Likert ratings. Participants tended to add comments only to the earlier ones, which suggested there were too many free-text boxes. Versions 8 provided just five free text boxes, corresponding to the four factors identified by principal components analysis, one of which was subdivided into two comment boxes. Version 9 further reduces the number of comment boxes to four. Each of these invites participants to give reasons for their numerical scores.

Final instrument

Version 9 presents the items in four sections, each with 2-7 Likert items and one free text box, which correspond to the factor structure as explained above. Respondents are asked to give limited demographic information, rate all 20 Likert Items, and (optionally) explain their ratings in the free text boxes.

Statistical analysis

The changes between Version 4 and Version 8 were modest and their psychometric properties were so similar that we pooled them for analysis. We report, here, the properties of the final 20-item version 9.

Data Cleaning and Removal of Multivariate Outliers

We excluded data from four participants who answered fewer than half the items. The Expectation Maximisation algorithm in SPSS v25 (IBM) impute the few other values (3%) that were missing from the dataset. Imputation changed the mean value of only one item by 1%, which indicated no major distortion. We identified and excluded a further seven multivariate outliers using the Mahalanobis Distance technique at a critical alpha value of 0.001, reducing the dataset to 255 participants.

Exploratory Factor Analysis

The Kaiser-Meyer-Olkin measure of sampling adequacy (0.77) and Bartlett's test ($p<0.001$) suggested a factorable solution was possible for the 20 items. These were theoretically linked and statistically inter-correlated (r values varying between 0.02-0.71 for bivariate correlations) so we chose Principal Axis Factoring as the extraction method with direct Oblimin rotation. The scree plot showed an inflexion point below the fourth factor so we chose a four-factor solution, shown in Table 1. For interpretive purposes, if the absolute value of the standardized loading was greater than 0.3, and the factor loading was at least 0.2 higher than other loadings, we considered an item relevant to a specific factor. We used Cronbach's Alpha, inter-item and item-total correlations to examine the internal consistency of these subscales.

The last three analytical stages were, first, to calculate, for each participant, a mean of the items loading to each factor (expressed as percentage of the scale maximum), compute group grand means, and test for differences between them using Kruskal-Wallis tests. Second, we examined the relationship between those factors and year of training (FY1 or FY2) and sex. The third stage was to select the 4 hospitals with over 30 participants attached to them and analyse relationships between hospital and factor scores.

Qualitative analysis

We chose activity theory, a well-established theory that is widely used to guide workplace education research (ref Johnston), to provide a priori themes for framework analysis. These were: subject; tools; rules; object; division of labour; community. All free text responses were entered into an Excel (Microsoft, Redmond USA) spreadsheet and coded to one or more themes. First, researchers read, re-read, and discussed a detailed report of the data, clustered by theme. This identified themes that cross-cut the categories. The data were then condensed, using a pragmatic focus to identify results that could guide improvement efforts.

Results

Two hundred and fifty-five FTs participated. Seventeen participants did not say what sex they were. One hundred and twenty-eight participants were women (54%) and 110 were men (46%). Nine participants did not specify which foundation year they were in. Of those who did, more were in the second (197 FY2s; 80%) than the first foundation year (49 FY1s; 20%) for reasons explained under 'recruitment'. Participants worked in thirteen hospitals and general practice, representing all five Trusts.

Principal Components Analysis and quantitative comparisons (Table 1)

The analysis converged in 11 iterations on a 4-factor solution, explaining 57% of the variance in the data. Participants rated their ability to prescribe higher (79%) than their ability to learn to prescribe (69%; $p<0.001$). They rated the support to their prescribing education rather low (43%; $p<0.001$ compared with their capability to prescribe or their capability to learn).

The one negatively worded item - Tensions - was also low (33%), suggesting that tensions with doctors or allied health professionals were not a major influence on participants' prescribing education. It is noteworthy, though, that 25% of participants rated tensions with allied professionals as moderately or severely affecting their prescribing education (5 or 6 on the 7-point scale), and 25% of participants rated tensions with doctors as slightly to severely affecting their prescribing education. The median tensions score of 50% suggests that the prescribing education of 1 in 2 participants was affected by tension with other staff.

None of the factors differed between male and female participants, between FY1 and FY2 doctors, or between hospitals.

Table 3: Results of principal components analysis

	Factor loading	Median (IQR)	Alpha if deleted
Factor 1: Capability to learn - Cronbach's alpha = 0.73			
I am in the habit of consulting books/online resources/guidelines to help me prescribe	0.71	3 (2-5)	0.67
I am in the habit of discussing prescriptions with other doctors (seniors or peers)	0.70	5 (4-5)	0.70
I use learning tools to increase my knowledge and skills	0.63	4 (3-5)	0.67
When I am unsure what is the right action, I seek guidance	0.60	5 (5-6)	0.70
I am in the habit of discussing prescriptions with nurses or pharmacists	0.57	4 (3-5)	0.73
I (would) like to receive constructively critical feedback on my prescriptions	0.57	5 (4-6)	0.72
Capability to learn (% of scale maximum)		69% (61-81)	
Factor 2: Capability to prescribe - Cronbach's alpha = 0.81			
I am confident I am on the path to being a good prescriber	0.78	5 (4-6)	0.77
I feel safe to put into practice what I learn about prescribing	0.74	5 (4-5)	0.77
I can distinguish simple prescribing decisions from difficult/ambiguous ones	0.66	5 (4-5)	0.80
When I recognise what action needs to be taken, I prescribe without hesitation	0.65	5 (4-5)	0.81
I can judge whether my knowledge and skills are sufficient for individual prescribing decision	0.65	4 (4-5)	0.80
I expect my foundation education will result in me prescribing well	0.61	5 (4-5)	0.80
I think out prescriptions logically rather than by habit	0.60	5 (4-6)	0.79
Capability to prescribe (% of scale maximum)		79% (71-86)	
Factor 3: Tensions – Cronbach's alpha = 0.83			
Tensions with other health professionals (e.g. nurses/pharmacists) affect my capability to prescribe well	0.93	2 (1-4)	Not applicable as only 2 items
Tensions with senior or junior doctors affect my capability to prescribe well	0.89	1 (1-3)	
Tensions (% of scale maximum)		33% (17-50)	
Factor 4: Support - Cronbach's alpha = 0.87			
The people where I work give me constructively critical feedback on my prescribing	0.91	2 (1-3)	0.81
The people where I work give credit for good prescribing	0.87	2 (1-3)	0.84
The people where I work encourage/support me to reflect critically on the quality of my prescriptions	0.80	2 (1-4)	0.84
The people where I work make a virtue out of acknowledging uncertainty and seeking help	0.73	3 (2-4)	0.88
The people where I work support my learning to prescribe	0.69	4 (3-5)	0.86
Support (% of scale maximum)		43% (27-60)	

Qualitative findings (Table 4)

Attributes of FTs themselves, of the practice communities of which they were members, of their educational environments, of the tools available to them, and of their jobs increased and/or reduced participants' prescribing education or were unavailable to them.

What made FDs more capable

People and practice communities

Supportive learning environments increased capability. In these, **senior and specialist doctors** increased capability, as did the expertise and supportive behaviour of **diabetes specialist nurses** (DSNs): 'DSNs very approachable - good to discuss issues with', 'love chatting to them, incredibly helpful' although the availability of senior doctors and DSNs depended on workload - 'If specialist diabetes nurse is available but they are often very busy' - and was at its least out of hours, when DSNs do not usually work.

Participants less often cited ward nurses and pharmacists as positive influences on their capability. **Ward pharmacists** were more a 'safety net' than someone to consult with prior to prescribing: 'Pharmacists picking up prescribing errors', and 'checking and flagging up any mistakes I make' increased participants' capability. Involving **patients** increased some participants' capability. This had the extra benefit that decision-making was shared: 'if patient is actively involved, better education and ownership', 'They know their own bodies'. It was not, though, possible for participants to involve confused and very unwell patients.

Professional members of practice communities increased participants' capability when they gave feedback that was 'constructive rather than critical', 'face to face and 'related to my prescribing'.

Experience

Many participants said 'experience' and 'practice' would made them more capable: 'With experience I'll get better'. These comments, though, did not say what aspects of practice would do this. Some participants looked up to senior doctors as examples of learning from practice. The one other insight into how participants learned from practice was their use of previous prescriptions written by peers as a benchmark for their own prescribing. Learning from practice, in this case, seemed to mean following on from what others had done before.

Teaching

Participants' comments, which identified teaching as something that improved their capability, were likewise unclear about how this did so, other than developing a good working knowledge of different insulins: 'trying to understand the different types of insulin and insulin regimes better'.

Tools

Well-designed prescription charts and clear documentation of patients' usual doses of insulin and changes to management plans increased capability. 'x Trust have easy to use insulin chart with the different types of insulin outlined on the back - I feel safer'. Some comments described how local protocols and guidelines increased capability, but these were not always available,.

What made FDs less capable

Difficult clinical problems

'More complicated patients', 'difficult prescriptions' and 'variability in each individual situation' made FDs less capable: 'Prescribing tends to be less straightforward than initially expected - lots of confounding factors'. There is an apparent contradiction between participants' stated belief that experience would make them more capable, this statement that dSpaceiffimore effectivelycult situations made them less capable, and the lack of support they described. These practice conditions do not seem conducive to good learning.

Being busy and under pressure

Working in busy and pressured learning environments made FDs feel less capable to prescribe. They experienced 'unnecessary pressure to prescribe quickly' and 'time pressure' whilst responding to 'high workloads'. Prescribing was made more difficult by 'distractions on the ward'

and ‘interruptions while prescribing’. Participants were sometimes left feeling they had insufficient time to engage with patients when prescribing insulin. Being expected to prescribe away from patients’ bedsides made this worse: ‘Nurses bring the kardex to you rather than you to the patient’. Relationships with nurses became strained: ‘Nurses often hand you kardexes and rush you to prescribe’, ‘Nurses telling me to do opposite thing’. Systemic hypophobia was manifested by ‘unwillingness from nursing colleagues to administer insulins in lower BMs’ and ‘Nursing staff frightened of hypos and would rather omit insulin’.

Poor documentation of patients’ insulin doses and management plans further reduced participants’ capability: ‘no well documented plan’, ‘No clear documentation from DSN on dose adjustments.’

Unhelpful criticism

Unconstructive, or frankly destructive criticism, reduced participants’ learning. Participants were unsure how to respond to this and left with doubts about their own clinical judgement. They found it unhelpful when other prescribers changed their prescriptions without explaining why: they ‘just changed the prescription without telling me what was wrong’; ‘Seniors disagree with my clinical judgement without explaining their clinical reasoning/rationale’.

Copying what others had done

Participants were aware that they were at risk of perpetuating poor prescribing practice but felt unable to do otherwise: ‘If someone else before me has prescribed incorrectly and I copy what they did ...’

What was missing

Feedback

Participants would have appreciated constructive feedback but rarely received this: ‘never get any feedback’; ‘very rarely get feedback, ‘there is no feedback’. Feedback was least available for out-of-hours work: ‘…you don't get any feedback whether you have done the right thing the next morning’. This lack of feedback left participants wondering if they ‘were doing the right thing’.

Other factors

Praise was missing; in the words of one participant: ‘no credit is given for good prescribing’. Follow-up was also missing. Heavy workloads and time pressures prevented participants knowing what happened to patients they had prescribed for: ‘No real follow up when insulin prescribed’. Encouragement to reflection on prescribing was rare and usually only followed adverse events. Participants did not know ‘where/how to access practically useful information’. They didn’t ‘know where the resources are’ and ‘lacked access to guidelines”. Even if resources were available, time constraints limited their use. Participants said more teaching would increase their capability but did not elaborate on the type of teaching they wanted.

A striking omission from participants’ responses was using one another as resources to increase their capability. Given that FTs are known often to consult with one another, they may have regarded peer support as so normal that it need not be mentioned. Participants might have made greater use of patients’ expertise. They chose only to discuss insulin prescriptions with ‘well informed’, ‘competent’ patients, ‘who normally look after their own regimen and are confident in doing so’. Some comments verged on dismissing patients’ roles in their own care, rather than having conversations with patients from which they might have learned: ‘I ask sensible patient what they want prescribed’; ‘Many patients don't understand their insulin’.

Table 4: Results of qualitative analysis

	What increased FDs' capabilities to (learn to) prescribe?	What reduced FDs' capabilities to (learn to) prescribe	Missed opportunities (what was absent in participants' learning environments)
FDs themselves	• Practice • Experience • Good understanding of insulin types	• Prescribing in difficult/complex scenarios	• Reflection on prescribing
Community	• Advice from senior doctors, DSNs, and occasionally nurses and pharmacists • Constructive verbal feedback • Teaching • Pharmacists picking up errors • Following the prescriptions of others • Good documentation of management plans	• Non-constructive criticism • Poor communication • Tensions with nurses • Following the prescriptions of others	• Insufficient feedback on prescribing • Teaching • Credit for good prescribing • Encouragement to reflect on prescribing • Missed opportunity to engage with some patients • Use of other FDs as a resource
Environment	• Supportive learning environments	• Lack of access to advice and support (especially OOH) • Distractions • Prescribing away from the bedside • Systemic hypophobia • Unfamiliarity with patients (covering wards/shifts)	• Support systems / availability of advice out-of-hours
Tools and Guidelines	• Well-designed prescription charts	• Difficulty finding and accessing guidelines	
The job of an FT		• Workload • Time pressures • The inherent complexity and uncertainty of prescribing insulin	

Discussion

This instrument operationalised readiness to prescribe by providing a reliable way of evaluating this for quality improvement purposes. It is novel and meets several validity criteria. (42) Its items were derived from robust conceptual frameworks and bear a logical relationship to the domain being measured. The response process left relatively few numerical items missing, which could be compensated for by imputation. The internal structure had acceptable reliability. We have not, however, shown a relationship between our measure and other variables and can only, at present, infer that testing will have impact. The inclusion of free text items, however, adds to the consequential validity of the instrument by identifying ways of improving learning environments, as well as measuring their quality.

The findings are important, given that first two years of practice play a crucial role in doctors' prescribing education. Participants were more likely to say they were capable of prescribing than that they were capable of learning to prescribe and they were least likely to say that the learning was supported. Tensions with the doctors who supervised them and the nurses with whom they work closely adversely affected the capability of 50% of participants. These undesirable features appeared to be of foundation education as a whole rather than of specific learning environments. The quantitative findings identified possibilities for improvement, most important of which is to foster a positive educational culture that values good prescribing, encourages constructive feedback, and learning, and promotes greater collaboration with fellow patients and professionals

Free text comments clarified some of the quantitative findings. Participants described an unreflective type of learning from experience in which they uncritically copied what others had done before and learned to 'get by' when faced with complex problems unsupported. Workload pressures, for example being presented with several prescription charts away from the bedside and being expected to prescribe quickly without assessing patients, coupled with pressure not to make patients hypoglycaemic, may have encouraged unreflective behaviour.

Implications

One limitation was the relative under-representation of FY1 doctors. Another was using relatively fragmentary qualitative data, rather than in-depth analysis of interviews or focus groups. The lack of difference between hospitals is another possible limitation because it may suggest the instrument is insensitive. An alternative explanation is that there were so many more similarities between learning environments than that differences between hospitals were obscured. The relative homogeneity of the research setting, within a single UK region served by a single deanery and medical school, may also explain the lack of difference between hospitals.

Limitations

The main implication is to healthcare quality improvement. The instrument addresses an important problem, has been rigorously validated in the contexts where it will be applied, and is therefore fit for wider implementation and evaluation. It has already identified ways of improving foundation trainees' practice and learning to provide safe and effective insulin therapy, which could have significant impact on patient safety. Since measuring the status quo, of itself, tends to change the status quo, we suggest the instrument should be used, without delay, to audit FTs' readiness to prescribe insulin. The deliverables section, following, lists other implications.

Deliverables of Workstream 1

Audit tool

This workstream has delivered the **'Readiness to Prescribe' questionnaire (RtPQ),** a reliable and valid audit tool, which is ready for immediate use to quality-improve foundation education. Whilst it was developed for insulin prescribing, it is transferable to other prescribing tasks, and potentially non-prescribing tasks.

This workstream has delivered, also, recommendations to improve the quality of prescribing education, supported by, and complementary to this audit tool

Quality improvement recommendations

Some changes that could be made **immediately without additional resources** include encouraging:

- Pharmacists to give feedback to FTs as part of their routine practice
- FTs to involve patients more in prescribing decisions
- All professionals involved in insulin management to manage patients proactively, rather than postpone prescribing decisions for others to make out-of-hours
- Diabetes professionals to promote wider use of well-designed guidelines, charts, and other tools that support good practice
- Senior doctors, nurses, and pharmacists to ensure all relevant guidelines are readily accessible on all wards
- Providers of off-the-job foundation education to teach FTs about insulins and their safe use
- FTs to find out what happened to patients whose insulin prescribing decisions were difficult or otherwise significant

Changes that could be made **immediately with relatively modest resources** include:

- Educating health professionals (supervisors, pharmacists, and nurses) to have educative conversations that highlight FTs' existing capabilities and make constructive suggestions for improving their capabilities (Constructive feedback)
- Use RtPQ to audit and quality-improve FTs' prescribing education, and further improve RtPQ in light of further experience

Longer-term changes with greater resource implications include:

- Greater involvement of DSNs in inpatient insulin prescribing
- Educating pharmacists to be more actively involved in insulin prescribing and FTs' education

Changes in prescribing cultures that could increase insulin safety include:

- Promoting a more positive attitude towards patient involvement
- Encouraging a more reflective approach to prescribing amidst the unavoidable pressures of contemporary NHS practice

This research also defines the **need for future, targeted, research** to clarify why:

- Tensions exist between FTs, nurses, and senior doctors
- Hypophobia is so widespread and how this could be alleviated
- FTs are reluctant or unable to obtaining help and advice when confronted with complex problems

The final section of this report will synthesise these conclusions with those of other workstreams to make recommendations for improvement in the whole system of hospital diabetes care.

Workstream 2. Social environments of foundation education

Stakeholders in insulin prescribing

Whilst it is FTs who put pen to paper, patients, nurses, pharmacists, senior doctors, and managers have a stake in insulin prescribing. First and foremost amongst these, patients receive the drugs prescribed. Professionals may exclude patients from prescribing decisions, which limits their stake to experiencing the consequences of professionals' decisions. Insulin, however, is a drug where it may be inappropriate for patients to have a passive role. As explained earlier, it would be very difficult for any ambulant, competent person to have a purely passive stake in their insulin treatment. Diabetic patients in hospital have a right to be involved in insulin treatment unless illness renders them completely incompetent. This gives health professionals the additional challenge of assessing patients' competence in the abnormal situations in which intercurrent illness places them. Professionals need to communicate well, be humble, and have positive attitudes towards collaboration.

Nurses often initiate prescriptions but do not usually write them. They may, for example, see that a diabetic patient's prescription chart has no dose of insulin written up for a time of day when insulin is needed. They may be concerned that the patient will come to harm if insulin is not given. The nurse calls a doctor, whom they may not know, to prescribe insulin for a patient, whom the doctor probably does not know. Both nurse and doctor are simultaneously busy with other tasks and there may be little or no conversation between the two. Under those circumstances, it is easy for patients to be excluded by doctors' and nurses' preoccupation with one another. And, in the context of insulin therapy, nurses' preoccupations may be at odds with doctors'. Insulin prescriptions can result in hypoglycaemia, which nurses have to treat long after the doctor has left the ward. This result in 'hypophobia' and pressure on doctors to give less insulin rather than more. As explained in 'Background', hypophobia can result in harmful hyperglycaemia.

Pharmacists ensure that hospitalised patients receive treatments they were on before admission, review prescription charts, identify errors, dispense drugs, and may also be involved in processes of formulating and administering treatments. Of all members of health care teams, pharmacists are best equipped with 'declarative' knowledge about drugs and safe prescribing. In hospital, however, they do relatively little prescribing and may be little involved in therapeutic decision-making. Hospitals employ fewer pharmacists than doctors and nurses. Pharmacists' main role, apart from dispensing, tends to be to advise and assure safety. Their greater involvement in education and care, however, is proven to improve doctors' clinical performance.

Key 'on the ground' stakeholders in FTs' insulin prescribing, then, arprope patients, nurses, and pharmacists. FTs are, nominally, supervised trainees rather than independent practitioners, so middle grade and senior doctors who supervise FTs are also important stakeholders. But, if one considers FTs on a surgical ward, for example, it is likely that neither middle grade nor senior doctors regard insulin therapy as their responsibility. It is then FTs' responsibility to do what they can and call for help from other sources when they can't. As well as being directly involved in patient care, nurses' stake in prescribing includes leading and improving clinical services, managing wards, responding to complaints and so on. The attitudes and behaviours of senior nurses strongly influence nursing practice 'on the ground'. Diabetes Specialist Nurses are the members of the nursing profession with greatest expertise in diabetes care. This is a relatively new sub-specialty and there are few of them, at least in Northern Island. Much of their time is taken up with the ambulatory care and education of patients so their ability to advise and support the care of sick inpatients is limited. Finally, managers have to juggle the costs of treatments, staff, prolonged lengths of stay, complications, and complaints. Managers include doctors, nurses, and pharmacists, but their perspective on practice may be a managerial one that is far removed from practice.

The training context

Foundation Training is managed by Deaneries. Northern Ireland's Foundation Programme is managed by the Northern Ireland Medical and Dental Training Authority (NIMDTA). This

management process entails recruiting FTs, organising rotations between four-monthly placements over the two-year of Foundation Training, providing some centralised induction and teaching events, and operating the nationally mandated assessment system, focused on satisfactory clinical performance and progression. Taking insulin therapy as an example, the ‘curriculum', and the pedagogy, is almost wholly informal and determined by FTs' workplace experiences. These experiences are determined by the service requirements that Trusts have to meet, rather than education. Supervisors, likewise, have a relatively informal and light touch involvement in FTs' education, other than 'getting the job done'. The social environment in which FTs learn most, therefore, is their working environment.

Aims and objectives

The aim of this workstream was to amplify the concept of 'readiness', introduced earlier, by surveying other stakeholders in insulin prescribing. The objectives were to:

- Use the same concepts that underpinned RTP – JD to develop survey instruments
- Apply these to other stakeholders
- Analyse the findings and draw conclusions that could improve FTs' readiness to prescribe

The work

Key stakeholders were patients, pharmacists, nurses, senior doctors, and senior leaders. The following pages consider each of these in turn.

Patients

MITS was not resourced, and therefore we did not design it, to make patient benefit an evaluable outcome. Despite that, the MITS Team agreed that the project would be incomplete if we did not audit patients' experiences of hospital insulin treatment, at least in order to develop an audit methodology for future studies. By negotiation with leaders of pharmacy education, we recruited pre-registration pharmacists (PRPs) to conduct an audit and designed an instrument that enabled them to do this.

Instrument

Our choice of audit instrument was determined by several considerations:

- Sick people in hospital are harder to survey in depth than healthy, articulate professionals
- Since PRPs were participating voluntarily, we must not ask too much of them
- Work we had done to develop the RTP instrument would be less applicable to patients than staff
- The National Diabetes Inpatient Audit, which provided baseline data for MITS, provided survey items, which were applicable to patients and we could adapt for our purposes
- The task had to be relevant, and within the scope of, PRP education.

Those practical considerations led us to devise, pilot, revise, and implement the survey instrument shown in Appendix X.

Survey Design

Seventeen PRPs, each supervised by a senior pharmacist tutor, administered the instrument to 286 patients in 9 hospitals, representing all 5 Trusts. With permission of ward managers, each PRP audited the care of at least ten opportunistically-selected adult inpatients. Patients could be on subcutaneous or intravenous insulin. To participate, patients had to be fit enough to answer several simple questions (See Annex X).

Analysis

One PRP collated the data in an Excel spreadsheet for a simple analysis of frequencies using SPSS, which TD (Principal Investigator) carried out.

Findings

How strongly did MITS influence this audit?

We infer that the findings represent the baseline state and were little affected by MITS because the PRPs surveyed 69% of participants in the first 4 months of the MITS implementation, when only small numbers of FTs had done CBDs. The survey included sites where CBDs were not done and, even in those where CBDs were done, fewer than 50% of prescribers participated.

Which specialties were represented?

The distribution of patients across specialty wards was:

Medical 48%; Endocrine 10%; Admissions/ED 6%; Surgical 14%; Care of the Elderly 5%; Other 18%.

Was insulin prescribed in advance?

Only 30% of prescription charts had a dose of insulin prescribed for the next morning. This increased from 18% of patients audited before 3pm to 65% of patients audited after 3pm. The proportion whose insulin dose had been prescribed by 3pm was greater in patients who had been hospitalised for 7 days or longer (80%) than in those who had been hospitalised for 6 days or fewer (54%).

What level of glycaemic control was achieved?

NADIA defines a 'good diabetes day' as a day when the frequency of testing was appropriate (according to defined criteria) and the patient remained within an acceptable range of glycaemic control. Forty-three percent of patients had had no good diabetes days and only 3% had had seven or more good days. Thirty percent had been hypoglycaemic. Since this statistic might have been influenced by an excess of patients staying a short time, we examined the subset of patients who

had been in hospital for 7 days or longer. The prevalence of good diabetes days were similar: 42%, and 3%, as was the prevalence of hypoglycaemia (28%).

Did clinical staff involve patients in their care?

There were two measures of this: whether staff had discussed glycaemic control, and whether they had discussed insulin doses. Thirty-five percent of participants said nobody had discussed their blood sugar reading with them in the preceding 24 hours and 39% said nobody had discussed their insulin dose.

Sixty percent of patients who were on insulin before they were admitted to hospital were making insulin dosing decisions. We reasoned that there was a greater responsibility for staff to involve these patients; 30%, though, said nobody had discussed their blood glucose and 33% said nobody had discussed their insulin dosing.

Conclusions

Control is unacceptably poor:

This audit confirms the NADIA finding that glycaemic control in hospitalised patients is suboptimal. Acute illness might make this avoidable in some patients but the poor control in longer stay patients suggests this is at least partly avoidable. Given the human and fiscal cost, we conclude that this avoidably poor level of control is unacceptable.

Clinical staff are not managing diabetes proactively:

Even by 3pm, 35% of patients had no insulin prescribed for the next morning. This cannot wholly be explained by patients being acutely ill because: 1) the sample included less acute wards; 2) No insulin dose had been written for the next morning by 3pm in 20% of patients who had been in hospital over a week. Failure to manage diabetes proactively may contribute to unacceptably poor control.

Clinical staff are not involving patients:

Even allowing for patients being acutely ill and forgetful, the statistics are concerning: one third of patients who were adjusting their own insulin before admission said nobody had discussed blood glucose levels or insulin doses with them in the previous 24 hours, which suggests they were not being appropriately involved in their own care. This, of itself, is inappropriate. It is possible, also, that not drawing on patients' expertise in managing diabetes contributes, also, to unacceptably poor control.

Implications

We chose two extremely simple surrogates for this audit: whether staff had prescribed insulin by 3pm as a surrogate for appropriately proactive management; and whether staff had discussed glycaemic control and/or insulin doses as a surrogate for patient involvement. Both show scope for change, which could improve performance against NaDIA targets. We suggest that campaigning for proactive insulin dosing and discussing therapy with patients could improve the experience and wellbeing of hospitalised patients on insulin. The success of this could be audited by monitoring performance against NaDIA targets.

Pharmacists

The original intention was for MITS to be pharmacist-led. Whilst other disciplines and patients became more involved more than we had originally expected, pharmacists retained a pivotal place. Auditing pharmacists' contribution to FTs' prescribing was, therefore, important. Having developed RTP–JD, we developed RTP–Ph to do this.

Instrument

We developed this by 'trawling' the spreadsheet from which we developed RTP–JD. Initially, we kept RTP–Ph as closely worded as possible to successive drafts of RTP–JD, but the need to implement RTP–Ph as widely and as soon as possible resulted in some unavoidable differences. Annex X shows the final instrument. It had five items, gathering descriptive data of the participants, and 11 mixed methods evaluative items.

Survey Design

We opportunistically surveyed as many pharmacists as possible across all 5 Trusts. The sampling process was not, strictly, representative and may have introduced biases of which we were not aware.

Analysis and reporting

DM (MITS administrator) entered information from completed questionnaires into an Excel spreadsheet and double-checked its accuracy against the original questionnaires. TD (Principal Investigator) analysed the quantitative data. Annex Xa contains relatively 'raw' output from the analysis, annotated by TD. Principal components analysis did not uncover any reliable internal structure within the questionnaire. It was not possible, therefore, to cluster items statistically so we present, below, frequencies of individual items, univariate, and bivariate analyses. We did not assume the data were normally distributed so we present median values with interquartile ranges (IQRs). The IQR is the range within which 50% of responses lay. Participants rated their agreement with statements on 0 – 6 (i.e. seven-point) Likert scales. So, for example, a median score of 5 represents strong but not absolute agreement with a statement. A median score of 2 represents slight disagreement. A lower quartile of 0 shows that at least 25% of participants completely disagreed with the statement. What follows is a précis of the findings.

AC (Medicines Governance Pharmacist) and TD independently analysed participants' free-text comments, developed a thematic structure, and synthesised the findings into a narrative summary, which is in Appendix Xb. Some key points from the qualitative analysis are précised in the next section.

Findings

Two hundred and eighty-six pharmacists participated. They covered a wide range of seniority and worked in all Trusts. A wide variety of types of ward was represented.

Pharmacists' capability to check insulin prescriptions

There was moderate agreement, and only slight disagreement (Median 4, IQR 3-5), with the statements that pharmacists had sufficient knowledge to check prescriptions and were able to evaluate their capability to do so. Strong disagreement with the statement that interprofessional tensions affected the quality of their checking. (Median 0, IQR 0-2)

Support and help-seeking

There was moderate agreement, and only slight disagreement with the statement that support was available when participants were unsure, and a slightly higher level of agreement (Median 4, IQR 3-5) that participants were in the habit of seeking help.

Involving patients

Most participants disagreed with the statement that they were in the habit of involving patients, and few agreed strongly. (Median 3, IQR 1-4)

Supporting FTs

Participants agreed (Median 4, IQR 4-5) that it was appropriate for FTs to request support from them but were a little less likely to agree that it was feasible for them to provide this support (Median 4, IQR 3-5) and less likely still to say they were confident to provide it. (Median 4, IQR 2-5). They disagreed (Median 2, IQR 0-3) with the statement that they give FTs feedback on insulin prescribing.

Participants' free text responses provided additional information. They were more confident to support FTs when they had good knowledge of insulin types and regimens, experience of endocrine practice, experience of advising FTs, and when patient problems were relatively straightforward. FTs appreciating their advice increased participants' confidence to advise. Participants were discouraged by being uncertain of what level to teach FTs, their advice being poorly received, and the distractions of a heavy workload.

The prescribing culture

There was little disagreement with the statement 'people make a virtue out of acknowledging uncertainty' (Median 4, IQR 3-5) but strong disagreement with the statement 'people give credit for good prescribing'. (Median 2, IQR 0-3)

Participants' free text responses provided rich information about prescribing cultures. Positive cultures were characterised by FTs asking for feedback and gratefully accepting it, and consultants behaving supportively towards pharmacists as well as FTs. Being in a supportive peer group, and fellow professionals such as diabetes specialist nurses being approachable and behaving non-hierarchically were other features of positive prescribing cultures.

Other comments explained how positive prescribing cultures made it possible to give and receive feedback. ‘The attitude that everyone needs to learn' meant it was never inappropriate to ask for help, which encouraged FTs to ask pharmacists' advice and pharmacists to give non-judgemental feedback. Senior pharmacists and other professionals who were happy to share learning and made a virtue of being uncertain and seeking help provided positive models, which encouraged other professionals to express uncertainty. Some people, however, were too shy or embarrassed to admit uncertainty whilst others discouraged this by being over-confident.

Positive cultures were not, however, ubiquitous. Some senior doctors did not recognise the work of junior colleagues and were defensive towards pharmacists. Previous negative experiences of feedback, a culture of blame, and being unduly preoccupied with adverse incidents and complaints discouraged people from expressing uncertainty.

Conclusions

A large sample of pharmacists provided rich descriptions of FTs' training milieu. Pharmacists were ready to support FTs' prescribing education. Those who were more knowledgeable and experienced were readier than less experienced colleagues, but the latter were reasonably well supported and ready to use this support and other information sources to increase their own capabilities. Workload made it less feasible for pharmacists to support FTs' prescribing education and the unsupportive behaviour that characterised negative prescribing cultures reduced participants' confidence. Negative behaviours included being inappropriately hierarchical, un-collegial, and resistant, which discouraged staff from acknowledging uncertainty and seeking and providing help and feedback.

Involving patients was not a feature of the prescribing culture, as represented by these data.

Implications

There is potential for pharmacists to contribute more to FTs' education to prescribe insulin, which has considerable potential to improve insulin safety. This will require education of less experienced pharmacists. The success of doing so will depend on the prescribing cultures in pharmacists' workplaces.

Nurses

Instrument

We developed this by adapting RTP–Ph to nurses. Annex X shows the final instrument. It had five items, gathering descriptive data about the participants, and 11 mixed methods items.

Survey Design

MITS implementers in 4 of the 5 Trusts gave the questionnaire, opportunistically, to nurses of varying seniority and on a variety of different wards.

Analysis and reporting

DM entered information from completed questionnaires into an Excel spreadsheet and double-checked its accuracy against the original questionnaires. TD analysed the quantitative data. Annex Xa contains relatively 'raw' output from the analysis. There were too few responses for principal components analysis. We did not assume the data were normally distributed so we present median values with interquartile ranges (IQRs).

TD analysed participants' free-text comments and wrote the narrative summary, which is in Appendix Xb. Some key points from the qualitative analysis are précised in the next section.

Findings

Seventy-six nurses participated. They covered a wide range of seniority and worked in four Trusts. There were 14 different ward specialities. Almost all participants were experienced in insulin treatment and some were heavily involved. Most gave advice regularly to FTs, but less often to more senior doctors. Most participants were actively learning or eager to learn.

Nurses' capability to contribute to insulin prescribing decisions

Most participants disagreed and those who agreed did not agree strongly with the statement 'I have the knowledge to contribute to prescribing decisions'. (Median 3, IQR 2-5) Support was, however, available (Median 5, IQR 4-6) and participants described themselves as in the habit of seeking help. (Median 5, IQR 5-6)

Nurses' capability to support FTs' prescribing

Most participants disagreed with the statement 'I have confidence to help junior doctors' (Median 3, IQR 2-4) and many disagreed that it was appropriate for FTs to ask advice or support, though some agreed. (Median 3, IQR 2-5) But few regarded it as feasible to support FTs. (Median 3, IQR 2-4). None gave feedback to FTs (Median 2, IQR 0-3).

Participants' free text comments described how nurses' knowledge of individual patients and contextual knowledge of practice made it appropriate for them to support FTs' prescribing. Nurses had an experiential type of knowledge that came from clinical experience. They were more confident to use that knowledge to support FTs's prescribing when they had good support from doctors and DSNs. Participants were less confident when patients were sicker, they feared treatment might cause harm, and lacked knowledge about new types of insulin. Participants' comments distinguished being knowledgeable and able to support prescribing from being responsible for prescribing. Doctors were responsible for prescribing. When asked about giving feedback, participants wrote about a type of feedback at the point of prescribing, averted harm. Participants' level of experience and concern that patients might be harmed encouraged them to give this. Doctors' unreceptiveness and nurses' concern about being disrespectful inhibited it. It was appropriate for FTs to discuss prescribing with them because it provided support and safeguarded patients' wellbeing.

Involving patients

Few participants disagreed with the statement 'I am in the habit of involving patients' and some strongly agreed with it. (Median 5, IQR 3-6) Participants' free text responses articulated nurses' responsibility to assure safe practice and make patient care their overriding priority. Participants normalised, and advocated, patients taking responsibility, or at least being involved in their own diabetes care, provided a patient was fit for this. Patients were a valuable source of

advice. Knowing a patient who had good knowledge of diabetes and was well controlled increased participants' confidence to contribute to insulin prescribing.

Prescribing cultures

A majority of participants disagreed with the statement 'People where I work give credit for good prescribing', some quite strongly, though some agreed with it. (Median 3, IQR 1-5) There was some mild disagreement with the statement 'the people where I work make a virtue out of acknowledging uncertainty and asking for help' and considerable agreement, some strong. (Median 5, IQR 3-6) Participants mostly disagreed with the statement 'Distractions and other pressures influence my contribution to insulin prescribing'.

Participants' free text comments normalised recognising one's limits and asking for help, at least within nursing. Not doing this was equated with being ashamed or unwilling to admit incapability. Participants characterised themselves as help/advice-seekers. They were prompted to seek help from other staff when FTs wrote prescriptions they disagreed with. Availability of help encouraged them to avail of help and its unavailability discouraged them.

Support

DSNs were a very valuable source of support. Pharmacists, specialist doctors, senior nurses, and peers were also a support. Some participants found written resources supportive. It was appropriate for FTs to discussing decisions was appropriate because it provided support and safeguarded patients' wellbeing.

Out-of-hours support (particularly from DSNs) was seriously lacking. Support was most available within normal working hours; the comments identified its unavailability out-of-hours as a serious problem for nurses.

Conclusions

Participants were a broad sample of nurses experienced, and in some cases heavily involved, in FTs' insulin prescribing. They lacked knowledge and confidence to advise or support FTs and did not regard it as appropriate/feasible to do so. They did not regard themselves as being responsible for insulin prescribing. Participants were, however, able to contribute knowledge of individual patients and experiential knowledge of ward practice. They were more confident to do this when they felt well supported and less confident when patients were sicker. They used their knowledge to avert harm, particularly when they were more experienced and if they were concerned a prescribing decision would cause harm. Participants rated their involvement of patients high and had an overriding duty to provide good care and assure safe practice. They normalised and advocated patients taking responsibility or being involved in their own care, provided they were fit to do so. Participants identified the workplace culture as one that does not give credit for good prescribing. They reported themselves to be ready to acknowledge uncertainty, recognise their limits, and seek help, and ready to do so if they felt a prescription might harm a patient, particularly if help was ready to hand. Diabetes specialist nurses were highly valued source of support, whose unavailability out of hours was regretted, when many participants felt inadequately supported.

Implications

These findings identify nurses as advocates for patients' wellbeing, safety, and involvement in their own care who contribute their experiential knowledge, as well as their knowledge of individual patients, to insulin therapy. Participants do not represent non-specialist nurses as people who could or should have responsibility for prescribing decisions, particularly when patients are sicker and the likelihood of harm is higher, though they are ready to call for help under those circumstances. The findings implicate diabetes specialist nurses as a very valuable source of support, but this does not extend to out-of-hours working, when nurses may most need support.

Senior and middle-grade doctors

Instrument

We developed this by adapting the structure and content of RTP–JD to fit senior and middle-grade doctors' roles in supervising FTs' prescribing or, themselves, prescribing. Annex X shows the final instrument. It had the similar questions about the person completing the questionnaire to the other RTP questionnaires and 24 mixed methods evaluative items, which were very similar to those in RTP-JD.

Survey Design

MITS implementers in all Trusts gave the questionnaire, opportunistically, to consultants and core/specialist trainees of varying seniority and on a variety of different wards.

Analysis and reporting

DM entered information from completed questionnaires into an Excel spreadsheet and double-checked its accuracy against the original questionnaires. TD analysed the quantitative data. Given the rather small number of responses, we have not included raw data in an appendix. We did not assume the data were normally distributed so we present median values with interquartile ranges (IQRs).

TD analysed participants' free-text comments and wrote the narrative summary below.

Findings

Thirty one senior and middle grade doctors, roughly half of each, participated. They worked in nine hospitals in all 5 Trusts. The ward specialities included acute medicine, diabetes/endocrinology, gastroenterology, and respiratory medicine. Over 90% of participants supervised insulin prescribing or prescribed it more often than weekly and 50% did so daily. Seventy-seven percent were either actively learning or would like to learn to supervise/prescribe better.

Participants' capability to supervise/prescribe

The median rating for all six items was 5 (IQR 4-5, except for prescribing without hesitation, which was 4-6). Experience increased their capability. Knowledge, including formally trained knowledge, and the availability of guidelines also increased it. One participant said patients' expertise increased their capability. System pressures such as being busy, and a lack of guidelines decreased their capability.

Influences on participants' capability to supervise/prescribe

No participant agreed that tensions with doctors or other health professionals or other people's standards of prescribing affected their capability to supervise/prescribe. They disagreed slightly more strongly that tensions affected their prescribing than that they were influenced by other people's standards. Despite their disagreement, participants' free text responses identified lack of forward planning, a lack of priority and a sense of urgency to prescribe insulin, fixed ideas about how to prescribe it, unawareness of the consequences of hyperglycaemia, people's fear of admitting their incapability to prescribe insulin, and fear of hypoglycaemia as adverse influences on insulin prescribing.

Participants' capability to model/support learning 'on the job'

No participant disagreed with any of the seven items. They agreed most strongly with 'When I am unsure what is the right action, I seek guidance' (Median 6, IQR 5-6). They agreed least strongly with 'I am in the habit of consulting books/online resources/guidelines to help me prescribe' and 'I am in the habit of discussing prescriptions with nurses or pharmacists' (Median 4, IQR 3-5). The median rating for all remaining items was 5, though some participants rated their agreement as low as 3 for 'I am in the habit of involving patients in prescriptions.' Experience, being in a supportive team or on a specialist diabetes ward, being asked for advice by juniors, and having been trained in patient-centred care encouraged participants to model or support FTs' learning. Time pressure discouraged this.

Influences on participants' capability to model/support learning 'on the job'

The highest agreement was with 'the people where I work support learning to prescribe' (Median 5, IQR 4-6) and 'the people where I work make a virtue out of acknowledging uncertainty and seeking help' (Median 5, IQR 3-5). The lowest agreement was with 'the people where I work give credit for good prescribing' (Median 3, IQR 2-5). Other items were rated intermediately (Median 4, IQR 3-5). Experience in a supportive team was described as 'vital'. It was important to avoid fixed preconceptions about patients' knowledge. Fear of criticism and lack of recognition of good prescribing inhibited learning.

Participants' education

Rating for the statement 'my prior education prepared me to prescribe' (Median 4, IQR 3-5) was lower than for 'I expect my current on-the-job learning to improve the quality of my prescribing (Median 4, IQR 4-6). Free text comments bore out these ratings. Experience on the job was the main source of learning. Participants noted there had been insufficient training early on and insufficient training in use of new insulins.

Conclusions

The study design and small sample size may have introduced a bias towards doctors who were more involved in insulin treatment, though inclusion of non-specialist trainees may have partially compensated. Conclusions, as a result, must be guarded. Participants rated themselves capable to supervise FTs by virtue of experience and, in some cases, formal training. Participants' numerical ratings suggested tensions with other workers and the prescribing culture did not reduce their capability to supervise but their free text responses suggested otherwise. Features of the social milieu – such as a lack of priority or urgency to prescribe insulin well – impaired their capability to supervise and prescribe. Regarding their capability to model and/or support FTs' learning, it is noteworthy that participants' ratings were lowest for their readiness to consult information sources, allied health professionals, or patients, whilst they rated experience and peer support as features of learning environments that increased participants' educational capabilities. Participants noted that a lack of credit for good prescribing and fear of criticism impeded learning. Participants were confident they would improve their (supervision of) insulin prescribing experientially and noted a lack of appropriate training.

Implications

These results hint at some important contradictions. The free text responses describe features of FTs' prescribing milieu that impede good practice and good learning whilst their numerical ratings do not so clearly show this. The findings suggest, also, that FTs' supervisors are confident that experience will improve proficiency, whilst noting deficiencies in the milieus where they and FTs will gain experience. There is a hint that participants had greater faith in experience within their medical collegial group than in seeking information or talking with patients and members of other professions. Participants' and FTs' reflection on experience (as opposed to their gaining experience) was not touched on in the free text responses.

The implication of this tentative interpretation is that efforts to improve the prescribing milieus where FTs learn and encourage reflection on experience – as opposed to simply becoming more experienced – might improve education for insulin safety.

Service leaders

Instrument

The 12 items in this instrument were presented in a similar way to other questionnaires, but the content was different. The questionnaire presented a set of constructs which, according to CIFR, predicted the likelihood of successful implementation in Trusts. Participants rated their agreement with the items on 0-6 Likert scales. The items were grouped into two clusters, at the end of which the questionnaire invited free text comments.

Survey Design

DM sent the instrument by post to 39 Chief Executives, Medical Directors, Directors of Nursing, Heads of Pharmacy, Directors of Medical Education, and Foundation Directors, and patient safety champions in all 5 Trusts

Analysis and reporting

DM entered information from completed questionnaires into an Excel spreadsheet and double-checked its accuracy against the original questionnaires. TD analysed and précised the data.

Findings

Twenty leaders (51%) participated, representing four of the five Trusts. They included doctors, nurses, pharmacists, and managers.

Participants' opinions of MITS

Participants' highest agreement was with 'I think we need to improve the way we educate junior doctors to prescribe insulin'. (Median 6, IQR 5-6) There was reasonably high agreement (Median 5, IQR 3-5) with 'I find MITS a credible way of educating junior doctors to prescribe insulin' weaker agreement with 'It is important to me to implement MITS' (Median 4.5, IQR 4-5) and least strong agreement with 'MITS is bundled and presented well' and 'MITS is a better way of educating junior doctors to prescribe insulin than any other way I know of.

Participants' free text comments favoured implementing MITS because they recognised the importance of providing more effective insulin safety education. Participants recognised that MITS drives reflective learning or 'coaching' and encourages FTs to identify what they need to know. Participants described MITS as user-friendly, transferrable to other drugs and areas for improvement, and compatible with the foundation programme. In the words of one participant, 'An opportunity to learn following reflection on real time events can be positive and encourages doctors to develop skills, knowledge and confidence.'

Participants' reservations about implementation MITS were, in order of frequency, availability of the time and resources to implement and sustain MITS and concerns about its novelty and unfamiliarity. One participant commented 'Too 'touchy feely' for such a high-risk drug'. This participant acknowledged the value of reflective learning, but regarded MITS as 'not fast or sufficient enough, given that FTs have to prescribe insulin from Day 1.'

Participants' opinions about how MITS fitted into their Trust

They were most likely to agree with the statements 'Leaders and managers in the Trust are held accountable for implementing safety initiatives like MITS' and 'Implementing MITS is important to the Trust' (Median 5, IQR 3-6) and 'MITS fits well with what external policy-makers expect my Trust to do'. (Median 5, IQR 3.5-5) They agreed to a varying extent with 'The Trust has the commitment to implement MITS' (Median 4, IQR 3-5) and 'People who work with foundation doctors are ready to admit fallibility and ask for help' (Median 4, IQR 3-4.75). Least strong agreement was with 'The Trust will be rewarded for supporting MITS' (Median 3, IQR 3-4) and there was some disagreement with 'Sufficient resources to implement MITS (training, physical space, and time) are available in the Trust. (Median 3, IQR 2-4)

Participants' free text comments identified the 'can do' attitude towards Quality Improvement in one Trust that had energetically implemented MITS, its culture of innovation and openness, the strength of senior support, and the extent to which doctors and pharmacists had been involved in MITS as reasons why their Trust would continue to do so successfully. In contrast, a participant in

another Trust (who had personally implemented MITS in one hospital in the Trust, but where uptake was otherwise low) said 'My Trust has shown NO engagement with the MITS project'. A participant in another Trust, which had also been relatively disengaged with MITS, predicted implementation would not be successful on the grounds that 'MITS has not demonstrated sufficient success to be used as a solution for such a high-risk drug'. Participants wrote that the successful implementation of MITS would depend on senior championship, engagement of FTs, and support from pharmacists.

Conclusions

There was general agreement that insulin education needed to be improved. MITS was rated a credible way of improving it and participants expressed a reasonable level of commitment and support to implementing MITS. There was support for reflective learning, with one notable exception, according to which a 'feely-touchy approach' was an inappropriate way of addressing a safety-critical task like insulin prescribing. Participants' main concern was the high workload and resulting pressure in the Trust's acute services. There was also some concern about its novelty.

The climate of accountability favoured institutional uptake of MITS, though some doubt was expressed that the internal climate in Trusts would favour successful implementation. The greatest doubt was about the availability of resources and Trusts being rewarded for using these to support MITS. There were striking differences between Trusts in their attitudes towards MITS, ranging from strong support, and confidence that the Trust would make MITS a priority and support it, to scepticism about its implementability. Senior championship and engagement of staff at all levels, participants stated, would be needed for the MITS implementation to be successful.

This interpretation is tentative because the response rate was low. It is noteworthy that the response rate was highest in a Trust that had embraced MITS at every level of seniority, and lowest in Trusts that had implemented MITS less wholeheartedly. There was a small number of responses from Trusts that had been least engaged in MITS and these included strongly expressed opinions for and against it. One could regard the differential response rate as a validity threat – or an indication that the attitude towards MITS was so different in different Trusts that the differential response rate reflected different Trusts' attitudes towards MITS rather than a validity threat.

Implications

These findings support the MITS team's experience of conducting the project. MITS was well received by many front-line practitioners but Trusts responded very differently from one another, the implication of which is that wider implementation will not be uniformly easy or successful. This means a choice will have to be made about further implementing MITS: doing so in all Trusts and accepting that its uptake will vary; or concentrating on 'flagship' sites in the next round of implementation. Given the doubt about its implementability, even among favourably disposed participants, it may be prudent to develop flagship sites and roll out from there, rather than implement at scale across Northern Ireland. If that is to be the policy, provision will need to be made for Trusts that are not flagships to provide a different type of insulin safety education to their FTs.

Aggregate summary of workstream 2

Impact on patients

NaDIA target: Glycaemic control

Forty-three percent of patients had had no 'good diabetes days' and only 3% had had seven or more good days. Thirty percent had been hypoglycaemic. Control was no better in the subset of patients who had been in hospital 7 days or longer.

NaDIA target: Patient involvement

Thirty-five percent of participants said nobody had discussed their blood sugar reading with them in the preceding 24 hours and 39% said nobody had discussed their insulin dose.

The involvement of patients who were used to caring for themselves

Forty percent of patients who were on insulin before they were admitted to hospital were not making insulin dosing decisions. Thirty percent said nobody had discussed their blood glucose and

33% said nobody had discussed their insulin dosing. This suggests there is scope for greater involvement of patients and greater use of their expertise.

Different professions' attitudes towards patient involvement

Many pharmacists disagreed with the statement that they habitually involved patients, and few agreed strongly (Median 3, IQR 1-4) whereas most nurses and senior doctors agreed with it (Nurses: Median 5, IQR 3-6; Senior doctors: Median 5, IQR 3-5). One senior doctor said patients' expertise increased his/her capability to provide care. Some nurses' free text responses normalised and advocated involving patients and giving them responsibility, and said patients were a valuable source of advice, provided they were fit enough. Despite rating their involvement of patients higher than pharmacists, only 50% of doctors and nurses agreed that they habitually involved patients.

FTs' education in diabetes management

Lack of proactivity

Our survey used the proportion of prescription charts that had a dose of insulin prescribed for the next morning as a marker of proactive diabetes management. Seventy percent of charts did not have this, which increased from 18% of patients audited before 3pm to 65% of patients audited after 3pm. We reasoned that patients who had been in hospital 7 days or longer and were audited in the afternoon were most likely to have insulin prescribed proactively. Still, 20% of charts had no morning insulin dose by the end of the working day.

There was other evidence of a lack of proactive diabetes management. Senior doctors noted that this problem existed, together with a lack of priority and a sense of urgency to prescribe insulin, and fixed ideas about how to prescribe it. Senior doctors cited unawareness of the consequences of hyperglycaemia, fear of hypoglycaemia, and fear of admitting their incapability to prescribe insulin.

Failure to manage diabetes proactively inevitably throws the responsibility for insulin prescribing onto staff working out of hours.

Out-of-hours

Nurse participants noted that their most important source of support – diabetes specialist nurses – was unavailable out-of-hours, when they (and, by inference, FTs) often needed support.

Interprofessional working in FTs' training milieu

Pharmacists were ready to support FTs' prescribing education. Those who were more knowledgeable and experienced were readier than less experienced colleagues, but the latter were reasonably well supported and ready to use this support and other information sources to increase their own capabilities.

Nurses were less ready to support FTs' learning and did not want to share responsibility for insulin prescribing. Nurses were ready, though, to make available their knowledge of individual patients, their experiential knowledge of insulin prescribing, and their knowledge of practice in their ward towards prescribing decisions. Good support from other nurses – particularly diabetes specialist nurses – made them readier to do this. Nurse participants did not routinely give feedback, and did not want to criticise prescribing disrespectfully, but were ready to intervene if they thought harm might result. Doctors' unreceptiveness inhibited nurses from making comments. Diabetes specialist nurses were a very valuable source of support, though this was unavailable out-of-hours.

The prescribing cultures in which FTs' learned

Positive cultures were characterised by seeking feedback and gratefully accepting it. In collegial professional groups, members of other professions were approachable and behaved non-hierarchically. This made it appropriate for FTs to ask for help and pharmacists to give it. Professionals who made a virtue of being uncertain encouraged other professionals to express uncertainty. Nurses' free text comments most strongly expressed a culture of recognising one's limits and asking for help.

Negative cultures were characterised by senior doctors not recognising FTs' work and being defensive towards pharmacists. A culture of blame and being unduly preoccupied with adverse incidents and complaints discouraged people from expressing uncertainty.

Asked specifically about prescribing, median ratings for agreement with the statement 'people give credit for good prescribing' were 2, IQR 0-3 (pharmacists) 3, IQR 1-5 (nurses) and 3, IQR 2-5 (senior doctors).

Culture of medical education

Senior doctors' ratings and free text comments placed strong emphasis on learning to prescribe from experience in supportive educational milieus, despite noting deficiencies in the milieus where they and FTs gain experience. They sought guidance from other doctors in preference to obtaining written information or discussing prescriptions with nurses, pharmacists, or patients. Being unduly busy and the absence of just-in-time information or guidelines decreased their capability. Participants would have valued better training in the use of new insulins. Service leaders made positive comments about reflective learning, but senior doctors advocacy for learning from experience made little mention of the reflective component of experiential learning.

Implications

FTs' educational environments would be improved by bringing the level of glycaemic control and patient involvement closer to national targets and improving the system of foundation education.

Deliverables of Workstream 2

Audit tools

The simple **tool used by pre-registration pharmacists to audit patients' involvement in care** proved informative. Since it is compliant with the National Diabetes Inpatient Audit, it has high face validity. This could be used for ongoing audit and its reliability and validity could be evaluated and improved.

None of the **other audit tools** used in workstream 2, has as clear validity evidence as RTPQ but they could be reviewed, revised, used for audit purposes, and further improved in light of psychometric analysis

Quality improvement recommendations

Some changes that could be made **immediately without additional resources** include encouraging:

- Pharmacists to give feedback to FTs as part of their routine practice
- FTs to involve patients more in prescribing decisions
- All professionals involved in insulin management to manage patients proactively, rather than postpone prescribing decisions for others to make out-of-hours
- A reflective approach to learning from experience that:
    - Questions and improves upon other people's actions rather than uncritically replicates these
    - Encourages active and critical information-seeking, as opposed to seeking and uncritically following advice

Changes that could be made **immediately with relatively modest resources** include:

- Increasing pharmacists' support of FTs' prescribing education
- Using the patient involvement tool to audit and improve this aspect of diabetes care

Longer-term changes with greater resource implications include:

- Greater involvement of DSNs in inpatient insulin prescribing
- Educating pharmacists to be more actively involved in insulin prescribing and FTs' education
- Greater support to out-of-hours insulin therapy

Changes in prescribing cultures that could increase insulin safety include:

- Promoting a more positive attitude towards patient involvement

- Encouraging a more reflective approach to prescribing amidst the unavoidable pressures of contemporary NHS practice
- Encouraging

This research also defines the **need for future, targeted, research** to clarify

Why:

- Tensions exist between FTs, nurses, and senior doctors
- Hypophobia is so widespread and how this could be alleviated
- FTs are reluctant or unable to obtaining help and advice when confronted with complex problems
- Prescribing cultures vary between different clinical units

How:

- Insulin safety education can increase FTs' readiness to prescribe effectively by means other than the preceding ones

The final section of this report will synthesise these conclusions with those of other workstreams to make recommendations for improvement in the whole system of hospital diabetes

Workstream 3. A novel education intervention to increase readiness to prescribe insulin

The MITS Intervention

Early in the implementation of MITS, we identified serious obstacles to implementing core features of the intervention we intended to use. First, it became apparent that the pressures of clinical services and shift working would frustrate attempts to bring foundation trainees together for group education, at least on any regular basis. Second, the senior pharmacists in our team were unsure that it would be feasible to identify errors in insulin therapy in the same way it had been possible to identify errors in antibiotic therapy. It is worth noting that, in earlier research, errors had been adjudicated by panels of experts before being fed back to trainees. Whilst this increased reliability, it cost time and money, which we did not have. Following the same procedure, at least for insulin, was not practicable. We had to develop an alternative intervention.

From feedback on error to empowering safer behaviour

The nature of insulin therapy, which is inherently very uncertain, required a different approach. The randomised trial had developed a bedside heuristic for safely approaching indeterminate prescriptions. We decided to use this as a way of enhancing prescribing. We went through a process of progressively condensing the heuristic and converting it into a reflective tool. We then went through a series of design iterations to present this tool (now called SMAC^2) in a simple, accessible format. We devised a simple set of 'top tips', which we distilled from our own experience of insulin prescribing. Annex 1 shows the final presentation of the heuristic and the tips, as presented on the two sides of a lanyard card. This, we hoped, would empower FTs to behave more safely. By making that decision, we had developed a novel pedagogy of safe prescribing.

From group to individual education

If group education was impossible, the alternatives were to provide no face-to-face education, or to provide one-to-one education. It is a well-established principle that supportive mentoring makes reflective learning more effective. But the problem remained: how would we engage FTs, who were too busy to attend educational events, to participate in one-to-one education?

Repurposing CBDs

CBDs are a mandatory component of FTs' portfolio learning. Our on-the-ground observation and enquiry showed us that CBDs were often formulaic and caused considerable frustration to both teachers and learners. Since they were mandatory, but unpopular, it occurred to us that we should try to turn them to better educational usage. The upshot was that we developed a standard operating procedure (SOP) for FTs to do some preparatory work, and then attend a short face-to-face meeting with a trained debriefer. The full SOP is shown in Annex 2. It was as follows:

- The FT chose an experience of insulin prescribing that was personally meaningful to them; it did not have to be a mishap or error
- They used the SMAC^2 reflective tool to interpret the experience in preparation for their case-based discussion
- A trained MITS debriefer met them for a supportive and empowering discussion lasting up to 30 minutes
- One endpoint of a debrief was for the FT to make specific, measurable, achievable, realistic, and time-bound commitments to more effective prescribing behaviour
- Another endpoint was for the FT to identify learning points
- The FT then entered these endpoints into their reflective portfolio, which was to be signed off by the debriefer
- We took the novel step of not requiring debriefers to be experts in insulin therapy because there were not enough experts available, and expertise is a two-edged sword in learner-centred

education; they did, however, have to be skilled in conducting supportive, empowering debriefings

Training the trainers

This novel educational approach required us, first, to work up our own skills as debriefers and then develop an SOP to educate others to debrief effectively. We recruited experts in the use of empowerment techniques to educate healthcare professionals in the management of diabetic patients. We repurposed their educational technique to train the trainers to conduct empowering discussions with FTs.

Implementing the procedures

Between May and July 2017, we conducted a test set of CBDs to test the tools and procedures we had developed, and refine these. In August 2017, we started a period of intensive debriefer training. From August 2017, we offered CBD to FTs in all 5 Trusts. To achieve that, we identified 'MITS champions' in each trust and 'MITS implementers' for whom payment was available to cover the cost of conducting debriefs.

Activity data

As well as the four professional members of the MITS Team, 56 pharmacists, doctors, and nurses, and 2 service users trained as debriefers. They conducted 113 CBD's, documenting these to a uniformly high standard.

Findings

The proforma shown on the fourth page of Annex 2 provided the template for debriefers' written records, which we transcribed verbatim and imported to the NVivo software for qualitative analysis. There were two other main sources of evaluation data. First, we invited FTs who had participated in CBDs to complete an online survey (Annex 9). Second, we invited a sample of debriefers to attend a focus group to analyse, in depth, their experiences of debriefing.

The results of case-based discussions

The dataset is so large that it had only been partially analysed at the time of writing this report. The analysis that follows is, therefore, selective. We report the number of statements that coded to informative themes and single out a small number of those for more detailed reporting, in order to strengthen the recommendations of MITS as a whole.

Theme: Challenging clinical situations (18 statements)

The principal investigator, who had 35 years of providing inpatient diabetes care before retiring from the NHS, identified 18 cases managed by FTs whose complexity he judged to be challenging to even an experienced doctor. Here is one example:

> *Patient transferred from ICU at night. Lot of comorbidities. Type 2 diabetes, obesity, hypertension, operation for bowel obstruction, aged early 50s. On IV insulin in ICU. F1 asked to prescribe insulin sc on ward. Didn't know patient. Before IV insulin she had been on Lantus 8 units. BG 5.2. Unsure and ended up holding. Checked in morning and blood glucose had been 6 – 7 overnight. Didn't think to ask patient. Nurses give you the purple sheet and ask you to prescribe and you don't know the background. Cautious about hypos – don't teach it to you at medical school.*

This patient exemplifies the expectation that FTs will handle difficult situations without the help of any other doctor, and when no advanced plan had been made for an inescapably difficult prescription. The following excerpt shows how socially isolated FTs have to navigate relationships with staff whom they don't know, or with whom they have difficult relationships.

> *Approached by staff nurse. Unable to administer Tresiba as didn't have it on ward (after midnight. Dr asked 'have you phoned Ward 17 (diabetic ward) patient should have had it at 10 PM.? Phone out of hours pharmacist. Patient complex needs. Chronic abdominal pain. 7/8th*

admission. Put off going to talk to her, as previous 'run-ins' with patient. Unusual type of incident. Unfamiliar with staff on Ward. Decided to omit insulin (checked BMs – okay not high or low).

Theme: Good practice (9 statements)

Debriefs identified excellent practice as in the following excerpt where a participant handled a difficult clinical situation well, and described the learning processes that led to this:

Hadn't met patient; 63, adrenal insufficiency, epilepsy, alcohol use, type 1 diabetes, and BMs all over the place – evening 20s, morning 2.2. Decided to look at trends and adjusted every dose. Referred to DSN. Wasn't sure about doses but DSN said it was spot on. Next day, all blood glucose was in range. Felt pleased because hadn't been confident about insulin. Had done assistantship in Belfast Trust – have sliding scale – doctor signs full range and nurses give specified dose if in the right range. Sometimes under pressure to prescribe immediately. Now says to nurse – 'Wait. I need to look at trends'. A friend had a bad experience and is now very nervous about insulin.

There were instances of appropriate patient involvement:

FY1 Dr on medical shift, out of hours. Asked to review type I diabetic patient who had had high BM's due to steroid treatment. Ketones were normal. Discussed management with patient and decided to watch and wait. F1 discuss this plan with SHO at mid-shift meeting – agreed with management. BMs settled over the course of the night.

And of responding effectively to uncertainty:

FY 2 Dr, psychiatry. Type II diabetes patients 60 years. Recently started on antipsychotics. increased rBMs (around 15 – 16). F 2 Dr was unsure how to best manage. Able to admit this and contacted DSN for support who adjusted the patient's insulin

Theme: Impact (4 statements)

The short timescale of MITS resulted in few participants attending more than one CBD, but there was some direct evidence that either repeat CBDs or the wider influence of MITS was changing behavior.

The MITS/SMAC2 process worked – FD learned from previous case

They are beginning to use SMAC2 … The art of insulin prescribing is a team effort.

FDs are beginning to recognise that involving patients can help improve insulin prescribing.

Trainee reflected that, having undertaken previous CBD's, MITS has helped them to think through this scenario and possibly manage patients better.

Theme: Commitments to behavior change (313 statements)

This project was not funded, powered, or designed to prove that MITS changes FTs' behaviour. COM-B theory (see introduction) and advice from health psychologists who work in medical education, however, led us to design CBDs to **motivate** FTs to change their prescribing behaviour and evaluate their written commitments to behaviour change as a valid intermediate outcome. Records of the CBDs contained 313 commitments – approximately three per participant. Each commitment contained 1-2 behaviors, so the total number of intended behaviour changes was 509. Table X reports a thematic analysis of these.

Table 5. 113 participants' 509 intentions to change their behaviour

First level themes	*Second level themes*	*Third level themes*	**N**
Directly improve their prescribing capabilities	Assess clinical situations more carefully		41
	Check prescriptions		20
	Manage diabetes more effectively		53
	Plan diabetes management ahead		8

	Involve patients more		21
	Seek help from experts and supervisors	Make better use of supervision Involve peers more Make better use of ward rounds Other	18 4 8 57
	Seek information		32
	Take more time or manage it better		9
	Think out prescriptions more carefully		11
Improve their learning capabilities	Be more active learners		15
	Follow through the effects of insulin doses they have prescribed		8
	Learn reflectively from experience		6
Manage prescribing situations better	Manage pressure or expectations		25
	Manage themselves	Be more confident Organise themselves better Other	3 22 29
	Work more collaboratively with other professionals and patients	Involve other professionals Involve patients Improve communication Other	34 34 36 1
Other			14

Theme: Other learning points

Whilst the primary intention of MITS was to help participants make commitments to behavior change, we invited FTs, also, to say what their debriefs had taught them. We identified 213 points, which will be thematically analysed for publication but are not reported in detail here.

Theme: Readily achievable targets for change

Our thematic analysis has not yet broken this theme down in detail, but debriefers identified the availability of learning materials, and the availability and professionals' knowledge of guidelines, as readily achievable targets for improvement. Better designed prescribing charts, already in hand at the time MITS was implemented, were another achievable target.

Theme: Candidates for change in the system of diabetes care

Debriefers identified candidates for changes that require organisational reconfiguration or additional resources. Many changes apply to all drugs, not just insulin. Insulin differs from other drugs in the level of expertise needed at the point of prescribing and the high potential risk of insulin therapy. Greater availability of expert advice for individual prescribing decisions both in and out of normal working hours was the main candidate for change.

Theme: Candidates for change in the culture of diabetes care

Subtheme 1: Proactive rather than reactive care. 14 statements.

The following excerpt exemplifies this theme:

> *FY1 doctor covering surgical ward at the weekend. 60 year-old type 1 diabetic admitted with?osteomyelitis (not known to FY1 doctor). Usual team had stopped all insulin on Friday; no weekend plan documented in notes.*

Participants described how daytime or more senior staff had not made proactive decisions, which resulted FTs having to make these out-of-hours. Sometimes, patients' diabetes had been uncontrolled for days before an on-call junior was asked to act. Sometimes, participants had to deal with the consequences of irrational actions, such as stopping insulin after a hypoglycaemic attack. Participants were asked to make difficult decisions quickly on patients they did not know the patient and when other urgent jobs were pressing on them. Whilst we have, to date, coded relatively few excerpts to this theme, most situations on which FTs debriefed arose out-of-hours and the types of situation quoted here were typical of FTs' work, not exceptional.

Subtheme 2: Reducing interprofessional tensions. 23 excerpts.

The data showed considerable tensions existed between professionals, particularly doctors and nurses. We did not interview nurses but infer that failure to plan or monitor insulin therapy caused them at least as much stress as FTs, which indicates a systemic problem. This resulted in situations that, from participants' points of view, were like these:

Was asked to prescribe insulin for patient on Friday evening. The nurse wanted me to prescribe the insulin doses until Monday morning to ensure patient didn't miss their insulin. I wasn't happy to do this because I was off duty and I didn't feel, in this case, the patient's BGs had been stable

FY1 asked by nursing staff to cancel a weekend (Saturday) morning dose of novo rapid for a type I patient who had not eaten breakfast. When FY1 asked for glucose value (18 millimole per litre) she felt a dose was necessary. This created conflict between nurse and FY1. Nurse reluctantly agreed to give a reduced dose (12 units versus 16 units). FY1 anxious in case this caused a hypo. Patient had hypo two days previous.

These and other excerpts identify scope for systems change to relieve stress on junior front-line staff and help them collaborate amicably.

Subtheme 3: Hypophobia and insulinophobia. 7 excerpts.

We coined the above two terms to describe a widespread phenomenon. There is a precedent for this in, for example, the term 'neurophobia'. Although we encountered this widely, only seven excerpts have (to date) been coded to this theme. These are examples of statements by FTs, or observations made by debriefers:

Insulin is intimidating

Cautious about hypos – don't teach it to you at medical school

FDs are scared of hypos

FTs' experiences of case-based discussions

Just 17 participants, 15%, completed an online survey of FTs' experiences of MITS. It is likely that these were on the whole more positively-minded participants. With such a low response rate, it is likely there was generosity bias. Fourteen (82%) of participants were FY1s. Three (18%) were FY2s. We list, below, the numerical findings item-by-item, with free-text statements that expressed the extremes of opinion.

MITS has encouraged me to discuss their insulin treatment with patients
Sixteen participants (94%) agreed or strongly agreed with this statement. One disagreed.

MITS has encouraged me to discuss their insulin treatment with other staff
All participants agreed or strongly agreed with this.

MITS has helped me deal with uncertainty aroused by prescribing insulin
One participant neither agreed nor disagreed. 16 (94%) agreed or strongly agreed

The SMAC2 tool has helped me prescribe insulin
Eight participants were neutral or disagreed (47%). Nine (53%) agreed or strongly agreed.

The MITS Top Tips have helped me prescribe insulin
One participant neither agreed nor disagreed. 16 (94%) agreed or strongly agreed.

Overall, MITS has helped me prescribe insulin
One participant neither agreed nor disagreed. 16 (94%) agreed or strongly agreed.

MITS has influenced aspects of my practice other than prescribing insulin
Four participants neither agreed nor disagreed. 13 (76%) agreed or strongly agreed.

I would tell a colleague that doing a MITS CBD is worthwhile

One participant was unsure. 16 (94%) agreed or strongly agreed.

Reasons why participants would tell a colleague a MITS CBD is worthwhile were:

- Good for portfolio requirements. Useful for ensuring safe insulin prescription.
- Useful to reflect on current practice and how it can be improved
- Insulin prescribing is something we do every day, and knowledge of insulin is crucial to patient safety. My CBD gave me the opportunity to discuss a case with a member of the MITS team, which I had not had the chance to discuss properly on the ward.
- Very helpful to talk through difficult prescriptions. Helps to get clear in your head how to get help with prescriptions. Discussing what I felt was a negative experience very much helped me to discover the positives and the learning points from that case
- Useful experience
- It's always good to reflect on our practice and see how we can improve
- It was worthwhile to reflect on how I prescribe insulin and to bear in mind that patients may have been independent with their own insulin prescription at home and therefore it is important to involve them in their own insulin prescription. I gained a better understanding from conducting a CBD with a service user that patient's may feel they are losing their independence with their insulin prescription when they come into hospital.
- Very useful and great to reflect on insulin prescribing with someone who has time to do so and is keen to.
- I now feel more confident at prescribing insulin and enjoyed having the opportunity to discuss insulin with a more senior doctor
- Whilst working on the ward there is seldom time to discuss insulin prescribing. So often it is done in a rushed environment, and MITS allows you to take time to question your prescribing. Being able to use it as a portfolio CBD is a great incentive to get F1/F2s involved

The survey invited participants to enter any other comments about MITS, which (apart from minor process issues) were:

- Useful exercise
- Very good
- Excellent experience all round
- Very well conducted. Great debriefer, who listened well and talk through a lot of situations. He encouraged you to think about what and why are we doing certain things.
- I conducted a CBD with both a service user and a pharmacist. I learnt different things from both of these CBDs - from the pharmacist I reflected more on giving patients autonomy over their own insulin prescription when it is safe to do so, I learnt that consultants can give patients permission to self-administer insulin. With the service user I reflected on a case where it was not appropriate for a patient to control her own insulin doses. I got a new perspective on how the patient may feel to have their insulin prescriptions taken over by medical staff, and will have greater empathy for patients as a result of this.
- Excellent debriefer, covered a wide range of points and discussed each in appropriate detail- didn't 'drag out' points just for the sake of it and also didn't skim over points too quickly
- It was very useful to conduct a CBD with a service user

Debriefers' experiences of CBDs

During a single focus group, 10 debriefers discussed their experiences of debriefing FTs in MITS CBDs. The following broad conclusions are based on notes taken during the discussion, rather than a thematic analysis of a transcribed audio-recording.

Participants described conducting MITS CBDs as a 'positive experience', in which FTs were 'relaxed and happy to talk'. It was a 'Useful/enjoyable experience.' A 'Specific approach with a designed aim, more meaningful.' They compared it positively to critical incident feedback because

MITS was ‘More relaxed and no blame’. MITS had ‘Shown the huge opportunity for learning from medicines incidents and near misses through discussion rather than reporting.’ CBDs were beneficial because these were ‘In-depth discussions’ which ‘reflected on the situation.’

CBDs had ‘Shown benefits of encouraging young doctors to discuss medicine related issues with other HCPs’ and ‘Shown how we need to widen our focus on how we make insulin therapy safer by not focusing on insulin mix-ups and delayed doses.’ Whilst some participants had been reluctant to train as debriefers because they were not diabetes specialists, ‘Not having direct clinical experience with insulin was not an issue.’ After CBDs, debriefers themselves felt empowered. Debriefing helped them understand the ‘messy parts of FTs’ role.’

One participant made the striking comment that ‘FY2s do not feel they need MITS as they don’t prescribe insulin anymore.’ This suggests that insulin prescribing not only falls to foundation doctors, but to the more junior foundation doctors. This contributes important additional insight into the system of insulin prescribing.

Participants had suggestions for improving MITS. These included ‘Joint CBDs – being able to share experiences with colleagues’. They suggested ways of ensuring the scale and spread of MITS. Optimising the uptake of CBDs could be addressed making these mandatory or including group CBDs in foundation education sessions. They suggested MITS debriefs might be used to help medical students learn to prescribe insulin and SMAC^2 might be promoted as a ‘generic reflection tool’ rather than just an aid to (insulin) prescribing. MITS could be included in advanced practitioner training. ‘Champions from each specialty’ could promote MITS

For MITS to be sustainable, participants said it would need ‘support from above’; organisations would ‘need to see the value of it’. There would need to be a ‘change of mind-set at all levels of staff’. A training body such as NIMDTA would need to take responsibility for delivering SMAC^2 training. One way of embedding MITS would be to offer hospitals MITS accreditation status.

Summary

MITS debriefs have provided examples of FTs managing challenging situation resourcefully and effectively. They have highlighted just how complex some situations are, in which FTs are expected to prescribe insulin – an archetypal high-risk medication – with limited support. Debriefs have shown, also, ways in which the system of diabetes care could serve patients, FTs, other doctors, nurses, pharmacists, and other health workers better.

This work stream has provided proof of concept for MITS. What was funded as a feasibility study succeeded in educating 22% of FTs in the Northern Irish healthcare system 40% of FY1s in all five Trusts. Even allowing for generosity bias, evaluation showed that participants found MITS CBDs educationally valuable.

Alongside FTs, MITS educated 58 pharmacists, doctors, nurses, varied widely in their seniority, and two service users conduct CBDs. Whilst uptake by debriefers was variable, at least some of them described it as a very acceptable and valuable pedagogy with some advantages over alternatives. Debrief is made numerous constructive suggestions to quality-improve MITS.

MITS was designed using leading contemporary behaviour change, education, and implementation theories and practices. It was also based on best available empirical evidence. Whilst this project was neither resourced nor designed to provide proof of patient benefit, there are good reasons to believe the intermediate outcomes that we were able to evaluate are valid.

FTs' commitments to involve patients more, collaborate more effectively with other workers, and make a range of changes in their clinical behaviour that would be expected to improve insulin safety are evidence that MITS had positive impact. In addition, the debriefs provided preliminary evidence that MITS is actually changing FTs' behaviour.

MITS fulfilled some recommendation of workstreams 1 and 2, reinforced those recommendations, and provided some additional recommendations. The findings of the three workstreams were remarkably complementary. Insulin safety could be improved by better availability of learning materials and guidelines, and greater awareness of these. By making diabetes

care more proactive and less reactive. By encouraging professionals to view insulin treatment more positively: to be less fearful of its negative effect, hypoglycaemia, and keener to give patients the benefit of its positive effect, euglycaemia. By supporting front-line workers better and reducing interprofessional tensions. And by improving access to specialist advice, including out-of-hours.

Deliverables of Workstream 3

Pedagogic tools

The main deliverable of workstream 3, and indeed of MITS, is a set of educational tools and supporting operating policies.

The **SMAC^2 reflective tool and its presentation on a lanyard card with 'hot tips'** is a central component of MITS.

A set of training procedures, educating professionals and service users to debrief FTs underpins the use of the **SMAC^2 heuristic** in case-based discussions.

A set of **educational procedures for debriefers and FTs to co-participate in conducting reflective case-based discussions** is the means by which debriefers support FTs' education.

Audit tools

The **record sheet on which debriefers keep records of case-based discussions** has proved to be a powerful audit tool, identifying factors that influence FTs' insulin safety education

The **online survey tool** has provided somewhat limited, but useful information about FTs' experiences of MITS.

Quality improvement recommendations

Implement MITS

We recommend that NIMDTA and Trusts jointly increase the scale and spread of MITS, using the tools delivered here to implement and evaluate it

Implement the following quality improvements

Some changes that could be made **immediately without additional resources** include:

- Informing current FTs about the commitments to behaviour changes which their peers made in the feasibility stage of MITS (See table X)

And encouraging:

- Senior and middle-grade doctors (including educational supervisors), pharmacists, nurses, and service users to help FTs make changes they have committed to, and changes listed in table X
- All professionals involved in insulin management to manage patients proactively, rather than postpone prescribing decisions for others to make out-of-hours
- A reflective approach to learning from experience that:
    - Questions and improves upon other people's actions rather than uncritically replicates these
    - Encourages active and critical information-seeking, as opposed to seeking and uncritically following advice
- Diabetes professionals to promote wider use of well-designed guidelines, charts, and other tools that support good practice
- Senior doctors, nurses, and pharmacists to ensure all relevant guidelines are readily accessible on all wards
- All staff to make greater use of these

Longer-term changes with greater resource implications include:

- Greater support from DSNs during working hours to FTs' insulin therapy
- Greater support from one or more sources to out-of-hours insulin therapy

Changes in prescribing cultures that could increase insulin safety include:

- Behaving supportively support towards front-line staff to reduce their stress and encourage them to collaborate with greater understanding of each other
- Encouraging a more reflective approach to prescribing amidst the unavoidable pressures of contemporary NHS practice
- Encouraging a more positive attitude towards insulin, which emphasises its benefits as well as its risks

MITS summary and conclusions

MITS took a systemic approach to education for insulin safety across Northern Ireland. It involved the single Deanery (NIMDTA), the one Northern Irish medical school (QUB), all 5 NHS Trusts, and all hospitals where FTs are placed. It involved service users, nurses, pharmacists, and doctors of all grades.

MITS surveyed the readiness to prescribe of about 50% of FTs in NI. It audited, also, a large sample of pharmacists, nurses, middle-grade and senior doctors. It audited a large sample of patients' involvement in their diabetes care. It trained 56 pharmacists, doctors, and nurses, and 2 service users with Type 1 diabetes in empowerment skills. This degree of interprofessional involvement in medical education is unusual. Involvement of service users in FTs' case-based discussions is unusual, if not unique.

MITS developed an entirely new workplace pedagogy, based on theory, empirical evidence, and a careful analysis of existing practice. This meets the need of foundation education and is complementary to existing, mandatory foundation education procedures. During its final stage, a feasibility study, MITS educated 20% of all FTs in the Region, including 40% of FY1s.

Evaluation of the intervention showed that FTs' and debriefers' reactions were generally positive. Participants made a large number of specific, measurable, achievable, realistic, and time-bound commitments to behaviour change and the evaluation found some preliminary evidence of these commitments being put into practice. This provides proof-of-concept for the intervention.

Deliverables

Pedagogic tools

- The **SMAC^2 reflective tool and its presentation on a lanyard card with 'hot tips'** is a central component of MITS.
- A set of training procedures, educating professionals and service users to debrief FTs underpins the use of the **SMAC^2 heuristic** in case-based discussions.
- A set of **educational procedures for debriefers and FTs to co-participate in conducting reflective case-based discussions** is the means by which debriefers support FTs' education.

Audit tools

- The **'Readiness to Prescribe' questionnaire (RtPQ)** is a reliable and valid audit tool, which is ready for immediate use to quality-improve foundation education. Whilst it was developed for insulin prescribing, it is transferable to other prescribing tasks, and potentially non-prescribing tasks
- A simple **tool to audit patients' involvement in care**. Since it is compliant with the National Diabetes Inpatient Audit, it has high face validity.
- **Other audit tools** that proved useful and could be reviewed, revised, used for audit purposes, and further improved in light of psychometric analysis
- **A record sheet on which debriefers keep records of case-based discussions,** which proved to be a powerful audit tool, identifying factors that influence FTs' insulin safety education
- An **online survey tool,** which provided useful information about FTs' experiences of MITS.

Recommendations for improving insulin safety

By triangulating between the findings of three different workstreams, each of which used rigorous research procedures, MITS generated a set of recommendations for improving insulin safety (education). These are compatible with best educational theory, empirical evidence, and practice as exemplified by the system of Health and Social Care it operates in Northern Ireland.

Pedagogic recommendation

- We recommend that NIMDTA and the HSCNI Trusts implement MITS, using the tools delivered by us to implement and evaluate it

Quality improvement recommendations

Some changes that could be made **immediately without additional resources** include

Informing:

- Current FTs about the commitments to behaviour changes which their peers made in the feasibility stage of MITS (See table X)

Encouraging:

- Pharmacists to give feedback to FTs as part of their routine practice
- FTs to involve patients more in prescribing decisions
- All professionals involved in insulin management to manage patients proactively, rather than postpone prescribing decisions for others to make out-of-hours
- Diabetes professionals to promote wider use of well-designed guidelines, charts, and other tools that support good practice
- Senior doctors, nurses, and pharmacists to ensure all relevant guidelines are readily accessible on all wards and encouraging all staff to make greater use of these
- Providers of off-the-job foundation education to teach FTs about insulins and their safe use
- FTs to find out what happened to patients whose insulin prescribing decisions were difficult or otherwise significant
- A reflective approach to learning from experience that:
    - Questions and improves upon other people's actions rather than uncritically replicates these
    - Encourages active and critical information-seeking, as opposed to seeking and uncritically following advice
- Senior and middle-grade doctors (including educational supervisors), pharmacists, nurses, and service users to help FTs make changes they have committed to, and changes listed in table X

Changes that could be made **immediately with relatively modest additional resources** include:

- Educating health professionals (supervisors, pharmacists, and nurses) to have educative conversations that highlight FTs' existing capabilities and make constructive suggestions for improving their capabilities (Constructive feedback)
- Use RtPQ to audit and quality-improve FTs' prescribing education, and further improve RtPQ in light of further experience
- Increasing pharmacists' support of FTs' prescribing education
- Using the patient involvement tool to audit and improve this aspect of diabetes care

Longer-term changes with greater resource implications include:

- Greater involvement of DSNs in inpatient insulin prescribing
- Educating pharmacists to be more actively involved in insulin prescribing and FTs' education
- Greater support from one or more sources to out-of-hours insulin therapy

Changes in prescribing cultures that could increase insulin safety include:

- Promoting a more positive attitude towards patient involvement
- Encouraging a more reflective approach to prescribing amidst the unavoidable pressures of contemporary NHS practice
- Encouraging a more positive attitude towards insulin, which emphasises its benefits as well as its risks
- Behaving supportively support towards front-line staff to reduce their stress and encourage them to collaborate with greater understanding of each other

This research also defines the **need for future, targeted, research** to clarify, for example:

Why:

- Tensions exist between FTs, nurses, and senior doctors
- Hypophobia is so widespread and how this could be alleviated
- FTs are reluctant or unable to obtaining help and advice when confronted with complex problems
- Prescribing cultures vary between different clinical units

How:

- Insulin safety education can increase FTs' readiness to prescribe effectively by means other than the preceding ones

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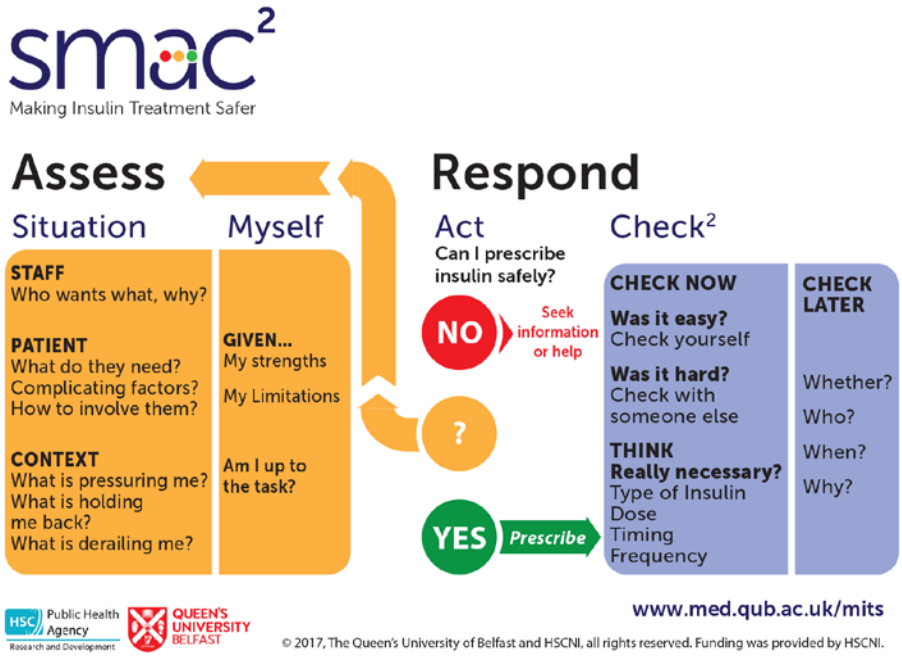
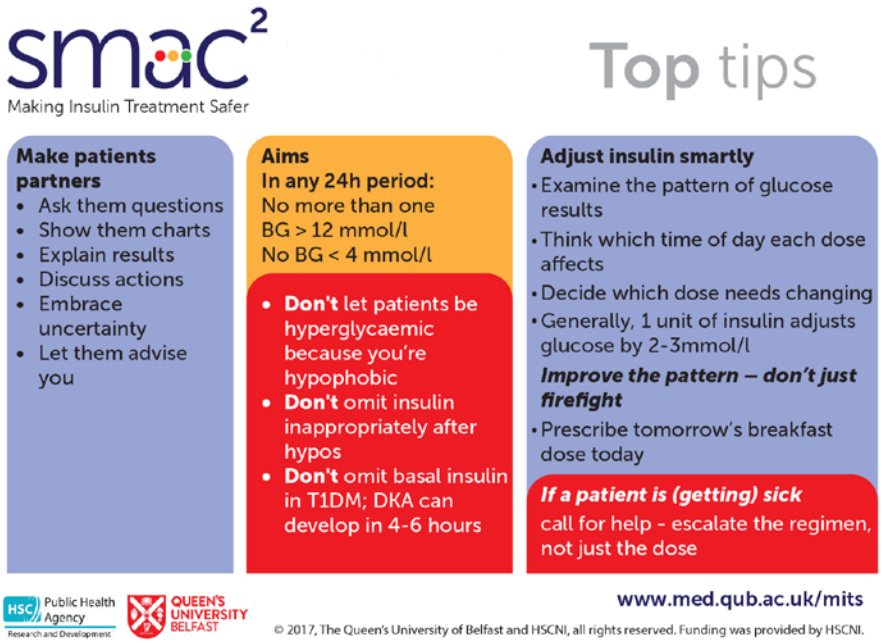
Annex 1: The SMAC^2 (lanyard card) reflective tool





Annex 2: Standard operating policy for training MITS debriefers and conducting debriefs

smac²
Making Insulin Treatment Safer

MITS Debriefer Training Booklet

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HSC Public Health Agency Research and Development
Queen's University Belfast

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Making Insulin Treatment Safer

MITS Factsheet

MITS: Service evaluation project funded by the HSC R & D Board

At the heart of MITS is a simple rule of thumb to act safely in complex situations: SMAC². This stands for: 'situation', 'myself', 'Act', 'check', and 'check again'. This is accompanied by some very simple 'top tips' for effective insulin prescribing.

Purpose: This project aims to improve the experiences of patients on insulin in hospitals, the education of Foundation Doctors (FDs) who write most of their insulin prescriptions, and the appropriateness of the prescriptions they write. It will empower FDs to:

- Handle the inherent complexity and uncertainty of prescribing insulin
- Work well with members of different disciplines and different levels of seniority
- Respect patients' right to be involved in their own care
- Access and make good use of other people and information sources

Implementation: 1/8/17 to 30/11/17

Where? Any site where FDs treat hospitalized patients on insulin

What has MITS done so far?

- Closely examined the nitty-gritty of hospital insulin prescribing and foundation education
- Developed audit tools including ways of measuring FDs' preparedness to prescribe in the face of uncertainty, how they are supported to do so, and the quality of their prescribing
- Developed a range of supporting materials
- Developed a set of procedures to offer FDs' educationally valuable 'case-based discussions' (CBDs)

What will MITS do next?

- Identify one or more 'MITS Champions' in each Trust
- Identify a 'MITS Implementer' to organise implementation of the intervention in each hospital where there are significant numbers of FDs
- Invite registrars/consultants, pharmacists, nurses, and service users to be trained as 'MITS debriefers'; this involves attending a half-day session to learn advanced education skills
- Offer all FDs CBDs

What is a MITS CBD?

- The FD asks their local MITS implementer for a CBD
- The MITS Implementer arranges for them to meet a MITS debriefer
- The FD identifies a significant event of insulin prescribing (criteria for significant events are provided) and completes a CBD proforma, which uses SMAC² to help them analyse it
- The debriefer helps the FD talk through the event, identify learning points, and make commitments to safe prescribing behaviour

How will we evaluate MITS? This is not an RCT so it will not answer the question 'Does MITS work'? It does, however, use improvement science, learning science, and a careful analysis of empirical evidence to answer the question 'What progress are we making towards furnishing NIMDTA, the five Trusts, QUB, and UU with a sustainable, potentially effective way of educating health professionals to practice safely amidst complexity?' The MITS approach could, potentially, help any health professional learn to handle any complex situation. It aims to be sustainable and transferable.

Who is conducting MITS? The key project workers are: Rosie Donnelly (Diabetes Pharmacist), Angela Carrington (Head of the NI Medicines Governance Team), Ciara Lee (Junior Doctor) Deborah Millar (Administrator, QUB), and Tim Dornan (Education Researcher, Former Diabetologist, and PI).

How can I learn more about MITS? Please feel free to email questions or comments to Rosie Donnelly (rosemary.donnelly@qub.ac.uk) or Deborah Millar (Deborah.Millar@qub.ac.uk) who will respond directly or forward your message to another member of the MITS Team.

MITS Case Based Discussion SOP

Documents to support this are underlined

Beforehand

- A foundation doctor (FD) makes an appointment to do a CBD with a trained MITS debriefer, who may be a doctor, pharmacist, nurse or service user
- The FD receives the CBD proforma, the MITS rules of thumb, and SMAC²/Top Tips card (which they should also have previously received) when the CBD appointment is confirmed, which should be at least 24 hours before it takes place
- The FD selects an insulin prescribing event in which (s)he has been involved using the (NDIA) criteria on the proforma to help them choose an appropriate one
- The FD completes the proforma by referring to the rules of thumb – they bring this with them to the CBD

The MITS CBD

- 30 minutes is scheduled for this
- It takes place in a quiet, comfortable setting, where it is possible to talk without being interrupted and is unhurried
- The CBD does not proceed unless the FD attends punctually having already completed the CBD proforma and brought it with them
- The debriefer acts more as a facilitator than an expert or critic (facilitation skills are explained later)

Beginning

- The debriefer, who has the, the SMAC² card, MITS Top Tips, MITS Rules of Thumb a blank Debriefer's record sheet, and a blank Trainee record sheet:
- Introduces him/herself and explains his/her role – to help the FD learn reflectively from experience of prescribing insulin
- Asks the FD to introduce him/herself
- Asks FD their grade
- Agrees when they will finish
- Asks the FD not to identify any patients or clinical staff concerned
- Undertakes to maintain absolute confidentiality about the discussion
- Explains (s)he wants this to be a 'safe space' where it is possible to talk about things that are difficult without being criticised

MITS Case Based Discussion SOP

The prescribing event (about 10 minutes)

The debriefer:

- Asks the FD to talk through the prescribing event, following the structure of the CBD proforma, preferably from memory rather than by reading what they wrote beforehand
- Listens attentively; if needed, asks simple, open questions to help the FD 'open up'
- Pays more attention to what matters to the FD than to slavishly following the proforma
- May use the the SMAC²-card, MITS Top Tips and/or MITS rules of thumb to provide helpful questions
- During this, the debriefer writes a brief note about the event being described

Enabling the FD to optimise their insulin prescribing (5-10 minutes)

The debriefer helps FD identify learning and make SMART commitment to future behaviour:

- Gives the FD a blank Trainee record sheet
- Places a copy of SMAC² card and the MITS top tips in front of themselves and the trainee.
- Asks the FD to record answer to the questions below on a blank FDs' record sheet and does the same on a Debriefer's record sheet using S, M, A, C or O (other) for each point

  -Asks 'In what aspects of SMAC² will you change your behaviour?'
  -Asks 'When and how will you do this?'
  -Asks FD to record this and does so themselves
  -Asks 'What might make you unsuccessful?' and 'How will you prevent that?'
  (May prompt FD by referring to other people's suboptimal behaviour)
  -Asks 'Overall, what have you learned about prescribing insulin well?'

Ending

The debriefer:

- Asks FD to upload their completed CBD proforma and Trainee record sheet to their ePortfolio
- Invites FD to ask any questions or make any final comments before finishing
- Wishes FD success in optimising their insulin prescriptions
- Invites FD to send a "ticket" via email for a CBD entry to be completed by the debriefer in their ePortfolio
- Completes the final section of the record sheet:
  - Rates potential harm/benefit to patient
  - Rates emotional impact of event on trainee
  - Rates how clinically challenging the event was
  - Completes the sentence: 'This CBD taught me (the debriefer) that a systemic issue, or issues, affecting learning to prescribe or prescribing insulin is/are ...'
- Returns Debriefer record sheet to site MITS implementer, who forwards it to Deborah Millar for analysis

Guide to facilitating a MITS debriefing

Attributes of an effective facilitator

Effective facilitators show 'relationship leadership' and 'task leadership'

They Model:
- Relationship behavior
- Transparency of thought processes
- Openness to question and criticism
- Willingness to express emotions

They show:
- Consideration and sensitivity towards learners

They 'initiate structure' in:
- Roles
- Procedures
- Communication

A facilitator will suit most learners best if they are not too controlling; they can stimulate people by exercising less control than the learner might at first want ('constructive friction'). That argues for a sensitive and flexible style of facilitatorship, which senses the needs of the group, but exercises the least control that is acceptable to them.

Facilitation Skills

Useful skills are:

1. Listening attentively
2. Paraphrasing
3. Making appropriate use of open and closed questions
4. Summarising
5. Responding positively to learners' contributions
6. Clarifying what learners have said
7. Acknowledging feelings
8. Negotiating when needed
9. Challenging appropriately
10. Contributing content knowledge appropriately
11. Managing time
12. Closing the session on a positive note

It may be helpful to ask an FD to reflect on:

- Positive affects: i) Motivation
  ii) Confidence
- Negative ones: i) Ambivalence
  ii) Uncertainty
  iii) Resistance
  iv) Denial

As the debriefer helps the FD commit to change, they encourage positive feelings by, for example
- Encouraging the FD to identify and reflect on past successes
- Talk positively about the FD's capability to change
- Giving praise when it is due
- Helping the FD to construct the self-identity of a safe insulin prescriber

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SMAC² Rules of Thumb

Situation

How did you address the *situation*?

a) Who was asking you to do what and why?
b) What was the patient's need?
c) What other factors were influencing this situation?
   i. Features of the patient?
   ii. Factors in the prescribing environment?
d) How did you, or might you have involved this patient in the decision?
e) How might those factors have made this prescription (un)successful?

Were you aware that pressure causes errors?

Myself

How did you assess *yourself* and the resources available to you?

a) What were your strengths and limitations?
b) How well did you feel able to respond to this situation, taking into account:
   i. The nature of the situation
   ii. My abilities or resources

Did you have the courage to be uncertain?

Action

How did you decide on *action*?

a) What did you do?
   i. To fill the resource gap
   ii. To involve this patient in the decision
   iii. To meet the patient's need

Did you hesitate to seek information or advice; were you proud of asking?
Did you know what to do? If you didn't, did you hold back and ask for help?

Check

Did you *check* your actions were sufficient and correct

a) Was insulin truly needed?
b) Had you chosen the insulin that was most appropriate for this situation?
c) Had you considered dose, frequency, and duration?
d) Had you used all the requisite and available resources?
e) Had you appropriately involved the patient?

Did you check, and check again?
If the prescription was easy to decide on, did you check it yourself for silly slips?
If the prescription was hard to decide on, did you ask someone else to check it for mistakes?

f) If someone advised you what to do, did you listen critically to their advice? Did it seem wrong or sound alarm bells? Did you respond appropriately to those alarm bells?

Did you, as a final check, ask yourself if there was a reason against the prescription you had decided on (a contraindication or interaction, for example)?

... And check again

Did you consider whether or not the patient's response to your action needed to be *reviewed*? If so, was your action working out as intended?

a) Did the *situation* still seem the same or had it changed?
b) Did you need, or could you now access additional *resources*?
c) Did you need to change what you had done, or take additional *action*?
d) Did you *check* that any action you took was sufficient and correct?

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Assess

Situation

STAFF
Who wants what, why?

PATIENT
What do they need?
Complicating factors?
How to involve them?

CONTEXT
What is pressuring me?
What is holding me back?
What is derailing me?

Myself

GIVEN...
My strengths
My Limitations

Am I up to the task?

Respond

Act

Can I prescribe insulin safely?

NO → Seek information or help

?

YES → *Prescribe*

Check²

CHECK NOW

Was it easy?
Check yourself

Was it hard?
Check with someone else

THINK
Really necessary?
Type of Insulin
Dose
Timing
Frequency

CHECK LATER

Whether?
Who?
When?
Why?

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Top tips

Make patients partners
- Ask them questions
- Show them charts
- Explain results
- Discuss actions
- Embrace uncertainty
- Let them advise you

Aims
In any 24h period:
No more than one
BG > 12 mmol/l
No BG < 4 mmol/l

- **Don't** let patients be hyperglycaemic because you're hypophobic
- **Don't** omit insulin inappropriately after hypos
- **Don't** omit basal insulin in T1DM; DKA can develop in 4-6 hours

Adjust insulin smartly
- Examine the pattern of glucose results
- Think which time of day each dose affects
- Decide which dose needs changing
- Generally, 1 unit of insulin adjusts glucose by 2-3mmol/l

Improve the pattern – don't just firefight
- Prescribe tomorrow's breakfast dose today

If a patient is (getting) sick
call for help - escalate the regimen, not just the dose

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MITS CBD Proforma

Please complete this proforma and bring it with you to your MITS CBD. Please ensure that there is no information written down that could identify patients or staff.

Good reasons for choosing an event for a MITS CBD are:

- A patient's blood glucose was >12mmol/l on more than one occasions in the previous 24 hours
- A patient's blood glucose was <4mmol/l on one or more occasions and/or they had a clinical hypo
- Some issue related to involving the patient or another professional made the prescription significant
- The event caused you uncertainty, difficulty, or satisfaction
- Another reason that made this event significant to you

WHY did you choose this event for your MITS CBD?

Use the SMAC² Rules of Thumb to prompt your answers below

Situation	What features of the patient, other staff, and context made this significant?
Myself	In what ways was the situation personally significant?
Action	What did you do to help yourself act safely and to treat the patient?
Check Now	How did you check your action was appropriate?
Check Later	(How) Did you check the patient's subsequent progress?

Foundation Trainee Record Sheet

With the SMAC² and top tips in front of you, the debriefer will ask the questions down the left-hand side and help you make commitments to safe insulin prescribing. Please ensure that there is no information written down that could identify patients or staff.

Questions	For every point in each box, write S, M, A, C, or O(ther) - examples below S) I will try to involve patients, where possible, in insulin prescribing decisions M) I will not hesitate to check with a registrar that I am up to the task O) When I move to a new ward, I will get to know the ward pharmacist
In what aspects of SMAC² will you change your behaviour?	
When and how will you do this?	
What might make you unsuccessful? How will you prevent that?	
Overall, what have you learned about prescribing insulin well?	

You can now send your debriefer a ticket for a CBD on your ePortfolio. You can also upload this completed record sheet to your ePortfolio library and link it to the CBD as additional evidence.

Debriefer Record Sheet

Debriefers Name: **Debriefer's Email:** **Date:**

Pharmacist ☐ Grade:_____ **Doctor** ☐ Grade:_____ **Nurse** ☐ Grade:_____ **Service User** ☐

Please rate your experience of prescribing, helping others prescribe, or treating yourself with insulin:

A little ☐ A moderate amount ☐ A lot ☐

Confirm that trainee has chosen a prescribing event and completed a proforma

What grade is trainee? FY1 ☐ FY2 ☐

Ask them to tell you why they chose the event and describe it in their own words

Write a brief, clear description of the event, why they chose it, potential harm/benefit, and why it was challenging:

Now put a copy of SMAC² and the top tips in front of yourself and the trainee.
Ask the questions down the left-hand side and write brief, clear notes in all boxes (continue overleaf if necessary)

Questions	Make a concise note of the answer. For every point in each box, write S, M, A, C, or O(ther) - examples below S) Trainee will try to involve patients more in insulin prescribing decisions M) Trainee will not hesitate to check with a registrar that she is up to the task O) When trainee moves to a new ward, she will get to know the ward pharmacist
In what aspects of SMAC2 will you change your behaviour?	
When and how will you do this?	
What might make you unsuccessful? How will you prevent that?	
Overall, what have you learned about prescribing insulin well?	

Thinking about this case and the discussion that followed, how would you rate the potential harm or benefit to the patient? Please circle. (NOTE that, in the event of serious potential harm or actual harm, you should follow the 'contingency' guidelines in order to assure patient safety.)

Maximum harm -2 -1 0 1 2 Maximum benefit

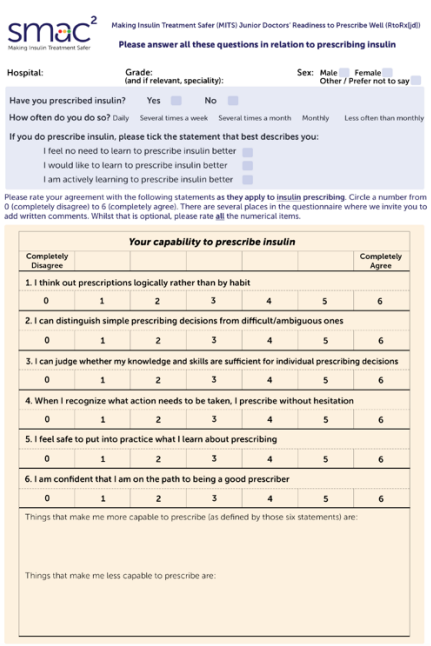
How would you rate the emotional impact of this event on the trainee, and how clinically challenging the event was?

Maximum discomfort/distress -2 -1 0 1 2 Maximum satisfaction/reward

Not at all challenging -2 -1 0 1 2 Extremely challenging

Please complete this sentence: This CBD taught me (the debriefer) that a systemic issue, or issues, affecting learning to prescribe or prescribing insulin is/are ...

Annex 3: Readiness to prescribe questionnaire (RTPQ) for junior doctors



smac² Making Insulin Treatment Safer

Making Insulin Treatment Safer (MITS) Junior Doctors' Readiness to Prescribe Well (RtoRx[id])

Please answer all these questions in relation to prescribing insulin

Hospital: Grade: (and if relevant, speciality): Sex: Male Female Other / Prefer not to say

Have you prescribed insulin? Yes No

How often do you do so? Daily Several times a week Several times a month Monthly Less often than monthly

If you do prescribe insulin, please tick the statement that best describes you:

- I feel no need to learn to prescribe insulin better
- I would like to learn to prescribe insulin better
- I am actively learning to prescribe insulin better

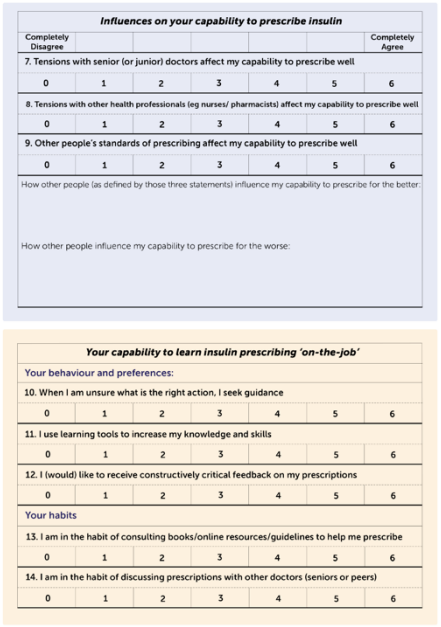
Please rate your agreement with the following statements **as they apply to insulin prescribing**. Circle a number from 0 (completely disagree) to 6 (completely agree). There are several places in the questionnaire where we invite you to add written comments. Whilst that is optional, please rate **all** the numerical items.

Your capability to prescribe insulin

Completely Disagree						Completely Agree
1. I think out prescriptions logically rather than by habit						
0	1	2	3	4	5	6
2. I can distinguish simple prescribing decisions from difficult/ambiguous ones						
0	1	2	3	4	5	6
3. I can judge whether my knowledge and skills are sufficient for individual prescribing decisions						
0	1	2	3	4	5	6
4. When I recognize what action needs to be taken, I prescribe without hesitation						
0	1	2	3	4	5	6
5. I feel safe to put into practice what I learn about prescribing						
0	1	2	3	4	5	6
6. I am confident that I am on the path to being a good prescriber						
0	1	2	3	4	5	6

Things that make me more capable to prescribe (as defined by those six statements) are:

Things that make me less capable to prescribe are:



Influences on your capability to prescribe insulin

Completely Disagree						Completely Agree
7. Tensions with senior (or junior) doctors affect my capability to prescribe well						
0	1	2	3	4	5	6
8. Tensions with other health professionals (eg nurses/ pharmacists) affect my capability to prescribe well						
0	1	2	3	4	5	6
9. Other people's standards of prescribing affect my capability to prescribe well						
0	1	2	3	4	5	6

How other people (as defined by those three statements) influence my capability to prescribe for the better:

How other people influence my capability to prescribe for the worse:

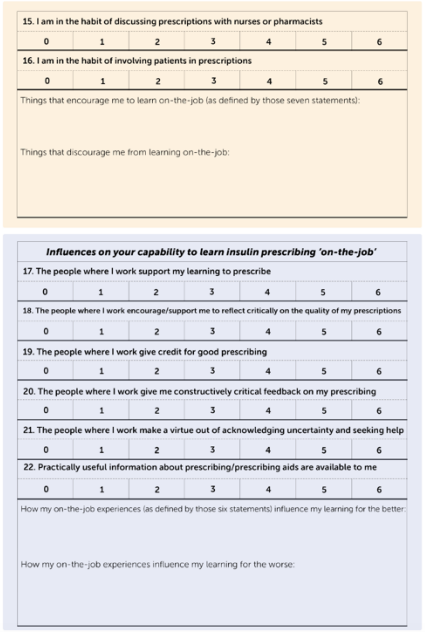
Your capability to learn insulin prescribing 'on-the-job'

Your behaviour and preferences:

10. When I am unsure what is the right action, I seek guidance						
0	1	2	3	4	5	6
11. I use learning tools to increase my knowledge and skills						
0	1	2	3	4	5	6
12. I (would) like to receive constructively critical feedback on my prescriptions						
0	1	2	3	4	5	6

Your habits

13. I am in the habit of consulting books/online resources/guidelines to help me prescribe						
0	1	2	3	4	5	6
14. I am in the habit of discussing prescriptions with other doctors (seniors or peers)						
0	1	2	3	4	5	6



15. I am in the habit of discussing prescriptions with nurses or pharmacists						
0	1	2	3	4	5	6
16. I am in the habit of involving patients in prescriptions						
0	1	2	3	4	5	6

Things that encourage me to learn on-the-job (as defined by those seven statements):

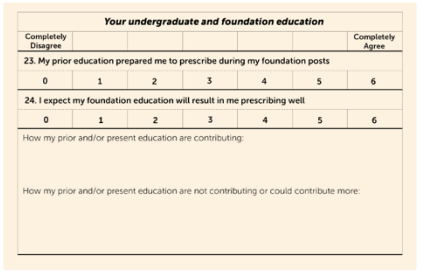
Things that discourage me from learning on-the-job:

Influences on your capability to learn insulin prescribing 'on-the-job'

17. The people where I work support my learning to prescribe						
0	1	2	3	4	5	6
18. The people where I work encourage/support me to reflect critically on the quality of my prescriptions						
0	1	2	3	4	5	6
19. The people where I work give credit for good prescribing						
0	1	2	3	4	5	6
20. The people where I work give me constructively critical feedback on my prescribing						
0	1	2	3	4	5	6
21. The people where I work make a virtue out of acknowledging uncertainty and seeking help						
0	1	2	3	4	5	6
22. Practically useful information about prescribing/prescribing aids are available to me						
0	1	2	3	4	5	6

How my on-the-job experiences (as defined by those six statements) influence my learning for the better:

How my on-the-job experiences influence my learning for the worse:



Your undergraduate and foundation education

Completely Disagree						Completely Agree
23. My prior education prepared me to prescribe during my foundation posts						
0	1	2	3	4	5	6
24. I expect my foundation education will result in me prescribing well						
0	1	2	3	4	5	6

How my prior and/or present education are contributing:

How my prior and/or present education are not contributing or could contribute more:

Thank you for completing this questionnaire.

Appendix 4: Survey of patients' experiences of insulin treatment in hospital by pre-registration pharmacists

smac²
Making Insulin Treatment Safer

Making Insulin Treatment Safer - Data Collection Form

Date of Audit: _____ **Trust:** _____ **Completed By:** _____

Time of Audit: Pre 15:00 / Post 15:00 **Ward Speciality:** Medical / Endocrine / Admission ward or ED / Surgical / COTE / Other

Part A

Has insulin been prescribed on the insulin chart until <u>at least</u> the next morning dose? Please circle

YES NO N/A _____ (add reason eg prescribed at night-time, switched to IV)

Number of nights the patient has been in hospital. Please circle: **0-6** (please write number of nights) : **7 - 28** **> 28**

<u>Over the past 7 full days:</u> (For this run chart, a full day means from 08:00 to 07:59 on the following day)

- Number of 'good diabetes days (see overleaf for definition of good diabetes days) :
- Number of hypo events (BG < 4mmol/l) :
- Number of hypos occuring between 22:00 - 08:00:

Part B

Please circle patient responses:

- Were you making decisions about your insulin dose before admission to hospital? YES NO N/A
- In the past 24 hours has anyone talked to you about your blood sugar reading? YES NO N/A Can't remember
- In the past 24 hours has anyone talked to you about your insulin dose? YES NO N/A Can't remember
- Thank the patient and ask if they have any questions / comments:
- If patient has concerns of queries about their care, please relay to a member of staff. **Staff Name:** _____

Thank Ward Manager before leaving ward

smac²
Making Insulin Treatment Safer

Making Insulin Treatment Safer - Data Collection Form
Notes for Student collecting data

Data to be collected by pre-registration pharmacist, in hospital Trusts across NI, for 10 random adult inpatient insulin kardexes (50% medical/admission or ED). Aim to collect data on 3rd Wednesday of each month & enter onto audit dashboard.

- **Introduce yourself to the ward manager**
- **Request permission to collect data**
- **Identify 2-3 patients currently prescribed insulin, either subcutaneous or intravenous**
- **Confirm with ward manager that these patients are fit and well and would be suitable to answer questions on their insulin prescribing experience**
- **If patient not suitable to speak with complete Part B as N/A**

Part A

<u>Definition of 'good diabetes day'</u>

- Frequency of tests appropriate
  - Daily for basal s/c, usually fasting.
  - Twice daily for s/c biphasic, pre insulin administration
  - Four times daily for s/c basal bolus, pre administration
  - Hourly for IV
  - Other; as indicated on monitoring sheet
- No more than one BG reading>11mmol/l
- No more than one BG reading<4mmol/l

Part B

- Introduce yourself to the patient (hello my name is .....I am a pre-reg pharmacist.....)
- Explain that you are collecting information on insulin prescribing
- Ask the patient if they would they be willing to answer some questions on insulin prescribing
- Record any comments patient provide (positive and negative) about experience with respect to insulin in hospital
- If you have relayed any patient concerns to nursing staff on the ward, document in part B.

Thank Ward Manager before leaving ward

Annex 5. The Readiness to (Support) Prescribing questionnaire for Pharmacists

smac² Making Insulin Treatment Safer

Making Insulin Treatment Safer (MITS) Pharmacist Readiness to Support Junior Doctors (RtoRx[P]) v3.1

Please answer all these questions in relation to insulin prescribing

Hospital: Grade: Speciality: Sex: Male Female Other / Prefer not to say

1. Do you have experience managing or reviewing patients prescribed insulin?

No Experience Some Experience Very experienced

Please expand if necessary:

2. Do you clinically check insulin prescription kardexes at ward level? Yes No

If yes how often do you do this?

Daily Several times a week Several times a month Monthly Less often than monthly

2a. If you clinically check insulin prescription kardexes, please tick the statement that best describes you:

I feel no need to learn to check insulin prescription kardexes better
I would like to learn to check insulin prescription kardexes better
I am actively learning to check insulin prescription kardexes better

3. Do junior doctors ask your help with insulin prescribing? Yes No

3a. If yes, how often?

Daily Several times a week Several times a month Monthly Less often than monthly

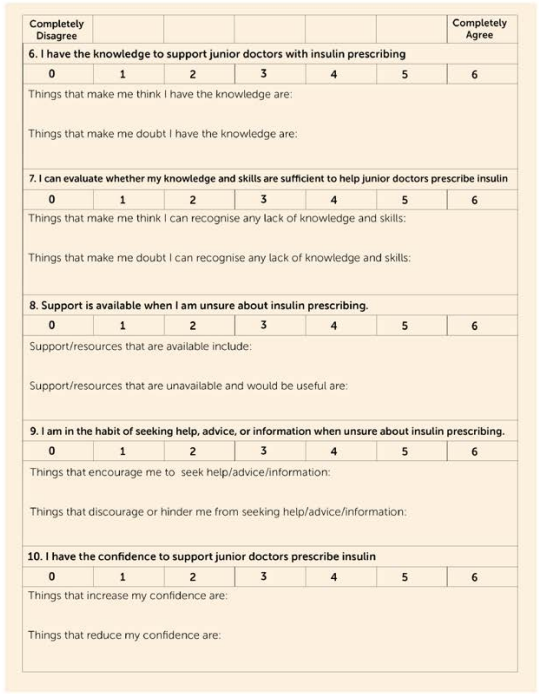
4. Do registrars/consultants ask your help with insulin prescribing? Yes No

4a. If yes, how often?

Daily Several times a week Several times a month Monthly Less often than monthly

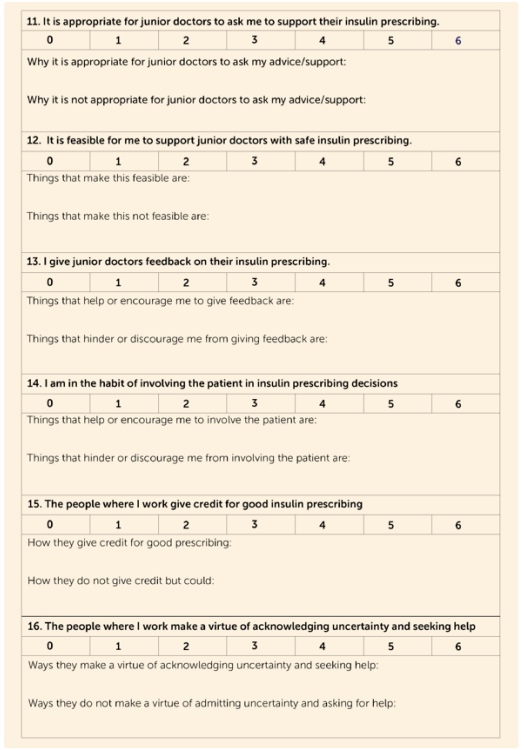
5. If you are asked for support, please indicate the type(s) of questions you are asked:

Insulin Type
Insulin Dosage
Insulin Dose Adjustment
Preventing/correcting hyperglycaemia
Preventing/correcting hypoglycaemia
Other:

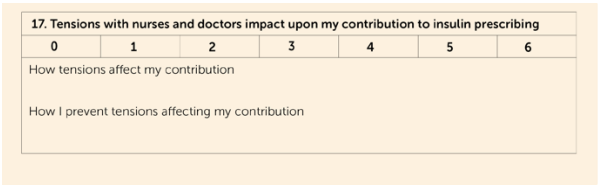


For question 6-17 please rate your agreement with these statements from 0 (completely disagree) to 6 (completely agree) by circling the relevant number. If you rated an item high or low for any particular reason, please (optionally) use the spaces provided to explain why; write on the back of the page if necessary

Completely Disagree						Completely Agree
6. I have the knowledge to support junior doctors with insulin prescribing						
0	1	2	3	4	5	6
Things that make me think I have the knowledge are:						
Things that make me doubt I have the knowledge are:						
7. I can evaluate whether my knowledge and skills are sufficient to help junior doctors prescribe insulin						
0	1	2	3	4	5	6
Things that make me think I can recognise any lack of knowledge and skills:						
Things that make me doubt I can recognise any lack of knowledge and skills:						
8. Support is available when I am unsure about insulin prescribing.						
0	1	2	3	4	5	6
Support/resources that are available include:						
Support/resources that are unavailable and would be useful are:						
9. I am in the habit of seeking help, advice, or information when unsure about insulin prescribing.						
0	1	2	3	4	5	6
Things that encourage me to seek help/advice/information:						
Things that discourage or hinder me from seeking help/advice/information:						
10. I have the confidence to support junior doctors prescribe insulin						
0	1	2	3	4	5	6
Things that increase my confidence are:						
Things that reduce my confidence are:						



11. It is appropriate for junior doctors to ask me to support their insulin prescribing.						
0	1	2	3	4	5	6
Why it is appropriate for junior doctors to ask my advice/support:						
Why it is not appropriate for junior doctors to ask my advice/support:						
12. It is feasible for me to support junior doctors with safe insulin prescribing.						
0	1	2	3	4	5	6
Things that make this feasible are:						
Things that make this not feasible are:						
13. I give junior doctors feedback on their insulin prescribing.						
0	1	2	3	4	5	6
Things that help or encourage me to give feedback are:						
Things that hinder or discourage me from giving feedback are:						
14. I am in the habit of involving the patient in insulin prescribing decisions						
0	1	2	3	4	5	6
Things that help or encourage me to involve the patient are:						
Things that hinder or discourage me from involving the patient are:						
15. The people where I work give credit for good insulin prescribing						
0	1	2	3	4	5	6
How they give credit for good prescribing:						
How they do not give credit but could:						
16. The people where I work make a virtue of acknowledging uncertainty and seeking help						
0	1	2	3	4	5	6
Ways they make a virtue of acknowledging uncertainty and seeking help:						
Ways they do not make a virtue of admitting uncertainty and asking for help:						



17. Tensions with nurses and doctors impact upon my contribution to insulin prescribing						
0	1	2	3	4	5	6
How tensions affect my contribution						
How I prevent tensions affecting my contribution						

Annex 6. The Readiness to (Support) Prescribing questionnaire for Nurses

smac²
Making Insulin Treatment Safer

Making Insulin Treatment Safer (MITS) Nurses' Readiness to Support Prescribing (RtoRx(N))

Please answer all these questions in relation to *insulin therapy*.
The term "insulin therapy"includes choosing an appropriate insulin preparation, dose, timing etc (but not including administration)

Hospital: Grade: Speciality: Sex: Male Female Other / Prefer not to say

1. Do you care for patients who are prescribed insulin? Yes No

1a. How often do you do so?

Daily Several times a week Several times a month Monthly Less often than monthly

2. If you are involved in insulin therapy, please tick the statement that best describes you:

I feel no need to learn more about insulin therapy
I would like to learn more about insulin therapy
I am actively learning more about insulin therapy

3. Do junior doctors ask your advice about insulin prescribing? Yes No

3a. If so, how often?

Daily Several times a week Several times a month Monthly Less often than monthly

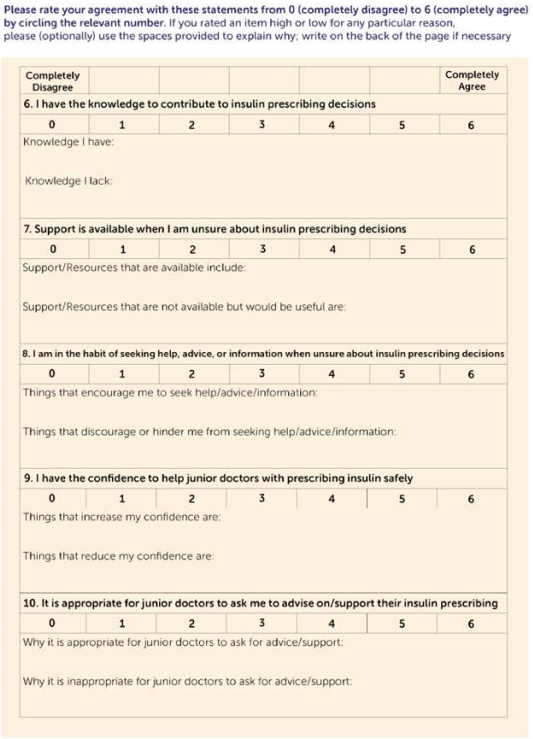
4. Do registrars/consultants ask your advice on insulin prescribing? Yes No

4a. If so, how often?

Daily Several times a week Several times a month Monthly Less often than monthly

5. If doctors do ask your advice, please indicate the type(s) of questions you are asked (tick all that are applicable):

Insulin Type
Insulin Dosage
Insulin Dose Adjustment
Preventing/correcting hyperglycaemia
Preventing/correcting hypoglycaemia
Other: _____



Please rate your agreement with these statements from 0 (completely disagree) to 6 (completely agree) by circling the relevant number. If you rated an item high or low for any particular reason, please (optionally) use the spaces provided to explain why; write on the back of the page if necessary

Completely Disagree						Completely Agree

6. I have the knowledge to contribute to insulin prescribing decisions

0	1	2	3	4	5	6

Knowledge I have:

Knowledge I lack:

7. Support is available when I am unsure about insulin prescribing decisions

0	1	2	3	4	5	6

Support/Resources that are available include:

Support/Resources that are not available but would be useful are:

8. I am in the habit of seeking help, advice, or information when unsure about insulin prescribing decisions

0	1	2	3	4	5	6

Things that encourage me to seek help/advice/information:

Things that discourage or hinder me from seeking help/advice/information:

9. I have the confidence to help junior doctors with prescribing insulin safely

0	1	2	3	4	5	6

Things that increase my confidence are:

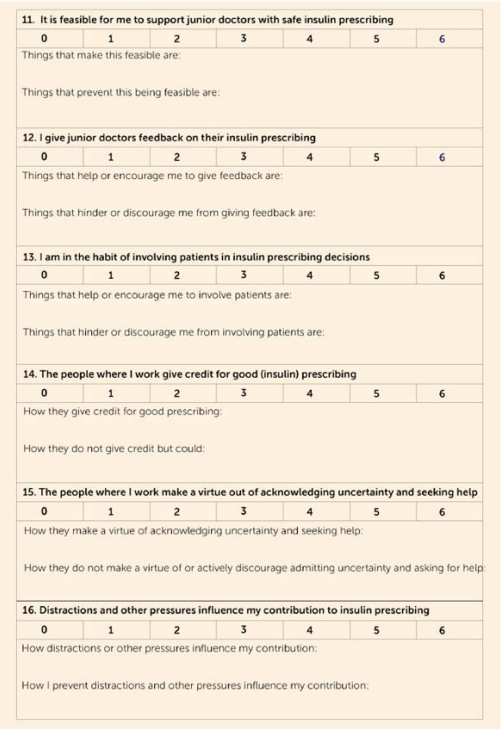
Things that reduce my confidence are:

10. It is appropriate for junior doctors to ask me to advise on/support their insulin prescribing

0	1	2	3	4	5	6

Why it is appropriate for junior doctors to ask for advice/support:

Why it is inappropriate for junior doctors to ask for advice/support:



11. It is feasible for me to support junior doctors with safe insulin prescribing

0	1	2	3	4	5	6

Things that make this feasible are:

Things that prevent this being feasible are:

12. I give junior doctors feedback on their insulin prescribing

0	1	2	3	4	5	6

Things that help or encourage me to give feedback are:

Things that hinder or discourage me from giving feedback are:

13. I am in the habit of involving patients in insulin prescribing decisions

0	1	2	3	4	5	6

Things that help or encourage me to involve patients are:

Things that hinder or discourage me from involving patients are:

14. The people where I work give credit for good (insulin) prescribing

0	1	2	3	4	5	6

How they give credit for good prescribing:

How they do not give credit but could:

15. The people where I work make a virtue out of acknowledging uncertainty and seeking help

0	1	2	3	4	5	6

How they make a virtue of acknowledging uncertainty and seeking help:

How they do not make a virtue of or actively discourage admitting uncertainty and asking for help:

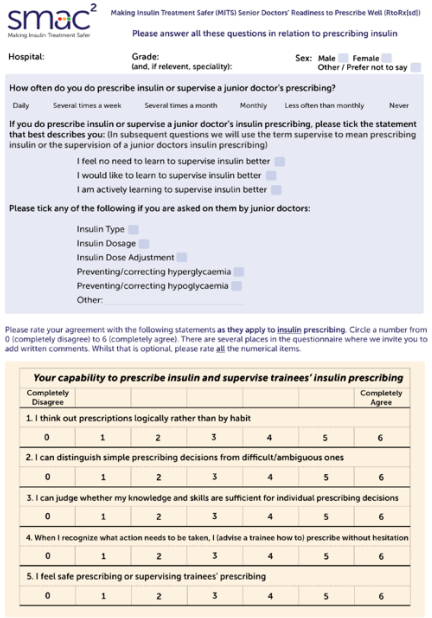
16. Distractions and other pressures influence my contribution to insulin prescribing

0	1	2	3	4	5	6

How distractions or other pressures influence my contribution:

How I prevent distractions and other pressures influence my contribution:

Annex 7. The Readiness to (Support) Prescribing Questionnaire for Senior Doctors



smac² Making Insulin Treatment Safer

Making Insulin Treatment Safer (MITS) Senior Doctors' Readiness to Prescribe Well (RtoRx[sd])

Please answer all these questions in relation to prescribing insulin

Hospital: Grade: (and, if relevent, speciality): Sex: Male Female Other / Prefer not to say

How often do you do prescribe insulin or supervise a junior doctor's prescribing?

Daily | Several times a week | Several times a month | Monthly | Less often than monthly | Never

If you do prescribe insulin or supervise a junior doctor's insulin prescribing, please tick the statement that best describes you: (In subsequent questions we will use the term supervise to mean prescribing insulin or the supervision of a junior doctors insulin prescribing)

- I feel no need to learn to supervise insulin better
- I would like to learn to supervise insulin better
- I am actively learning to supervise insulin better

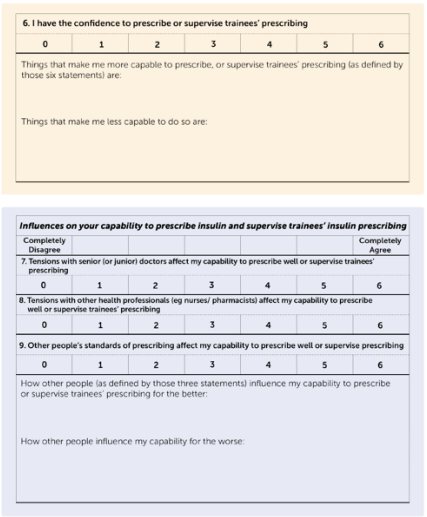
Please tick any of the following if you are asked on them by junior doctors:

- Insulin Type
- Insulin Dosage
- Insulin Dose Adjustment
- Preventing/correcting hyperglycaemia
- Preventing/correcting hypoglycaemia
- Other:

Please rate your agreement with the following statements **as they apply to insulin prescribing**. Circle a number from 0 (completely disagree) to 6 (completely agree). There are several places in the questionnaire where we invite you to add written comments. Whilst that is optional, please rate all the numerical items.

Your capability to prescribe insulin and supervise trainees' insulin prescribing

Completely Disagree						Completely Agree
1. I think out prescriptions logically rather than by habit						
0	1	2	3	4	5	6
2. I can distinguish simple prescribing decisions from difficult/ambiguous ones						
0	1	2	3	4	5	6
3. I can judge whether my knowledge and skills are sufficient for individual prescribing decisions						
0	1	2	3	4	5	6
4. When I recognize what action needs to be taken, I (advise a trainee how to) prescribe without hesitation						
0	1	2	3	4	5	6
5. I feel safe prescribing or supervising trainees' prescribing						
0	1	2	3	4	5	6



6. I have the confidence to prescribe or supervise trainees' prescribing

0	1	2	3	4	5	6

Things that make me more capable to prescribe, or supervise trainees' prescribing (as defined by those six statements) are:

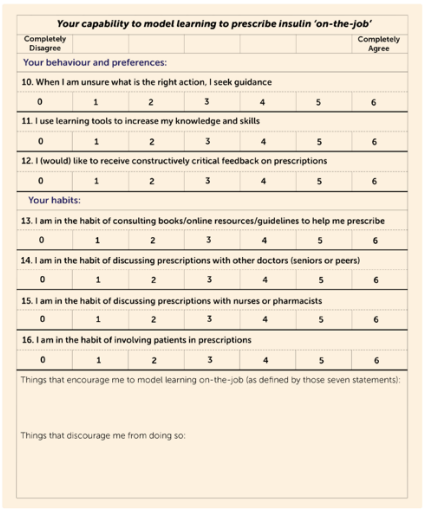
Things that make me less capable to do so are:

Influences on your capability to prescribe insulin and supervise trainees' insulin prescribing

Completely Disagree						Completely Agree
7. Tensions with senior (or junior) doctors affect my capability to prescribe well or supervise trainees' prescribing						
0	1	2	3	4	5	6
8. Tensions with other health professionals (eg nurses/ pharmacists) affect my capability to prescribe well or supervise trainees' prescribing						
0	1	2	3	4	5	6
9. Other people's standards of prescribing affect my capability to prescribe well or supervise prescribing						
0	1	2	3	4	5	6

How other people (as defined by those three statements) influence my capability to prescribe or supervise trainees' prescribing for the better:

How other people influence my capability for the worse:

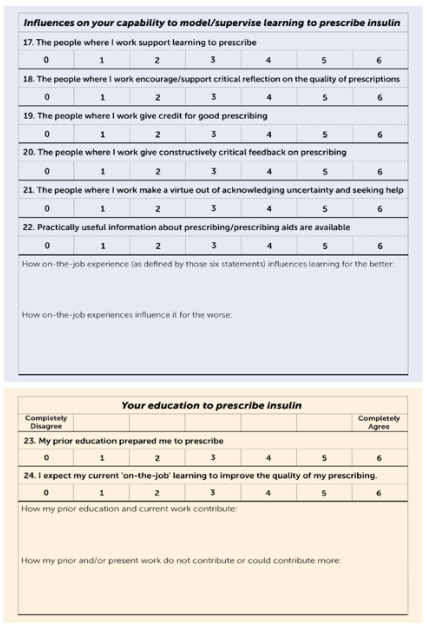


Your capability to model learning to prescribe insulin 'on-the-job'

Completely Disagree						Completely Agree
Your behaviour and preferences:						
10. When I am unsure what is the right action, I seek guidance						
0	1	2	3	4	5	6
11. I use learning tools to increase my knowledge and skills						
0	1	2	3	4	5	6
12. I (would) like to receive constructively critical feedback on prescriptions						
0	1	2	3	4	5	6
Your habits:						
13. I am in the habit of consulting books/online resources/guidelines to help me prescribe						
0	1	2	3	4	5	6
14. I am in the habit of discussing prescriptions with other doctors (seniors or peers)						
0	1	2	3	4	5	6
15. I am in the habit of discussing prescriptions with nurses or pharmacists						
0	1	2	3	4	5	6
16. I am in the habit of involving patients in prescriptions						
0	1	2	3	4	5	6

Things that encourage me to model learning on-the-job (as defined by those seven statements):

Things that discourage me from doing so:



Influences on your capability to model/supervise learning to prescribe insulin

17. The people where I work support learning to prescribe						
0	1	2	3	4	5	6
18. The people where I work encourage/support critical reflection on the quality of prescriptions						
0	1	2	3	4	5	6
19. The people where I work give credit for good prescribing						
0	1	2	3	4	5	6
20. The people where I work give constructively critical feedback on prescribing						
0	1	2	3	4	5	6
21. The people where I work make a virtue out of acknowledging uncertainty and seeking help						
0	1	2	3	4	5	6
22. Practically useful information about prescribing/prescribing aids are available						
0	1	2	3	4	5	6

How on-the-job experience (as defined by those six statements) influences learning for the better:

How on-the-job experiences influence it for the worse:

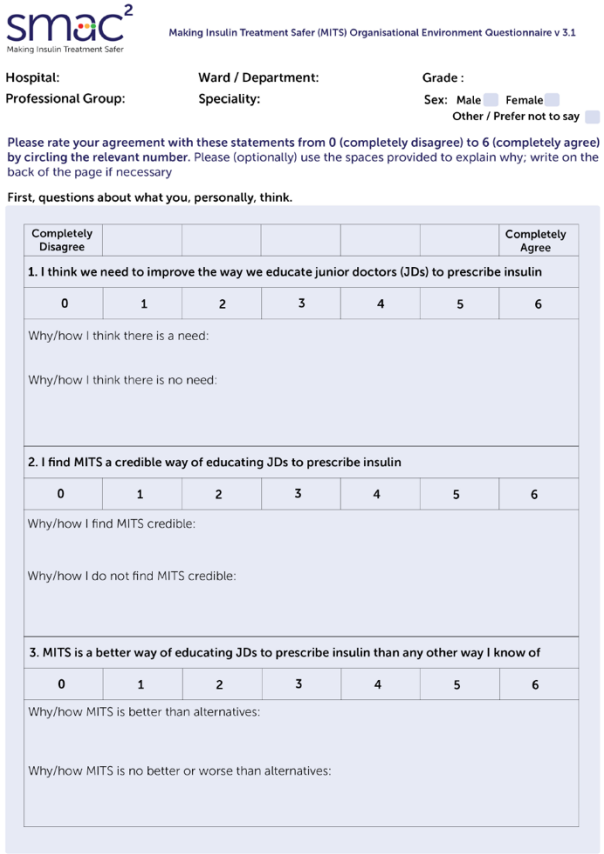
Your education to prescribe insulin

Completely Disagree						Completely Agree
23. My prior education prepared me to prescribe						
0	1	2	3	4	5	6
24. I expect my current 'on-the-job' learning to improve the quality of my prescribing.						
0	1	2	3	4	5	6

How my prior education and current work contribute:

How my prior and/or present work do not contribute or could contribute more:

Annex 8. The Readiness to (Support) Prescribing Questionnaire for Service Leaders



smac² Making Insulin Treatment Safer

Making Insulin Treatment Safer (MITS) Organisational Environment Questionnaire v 3.1

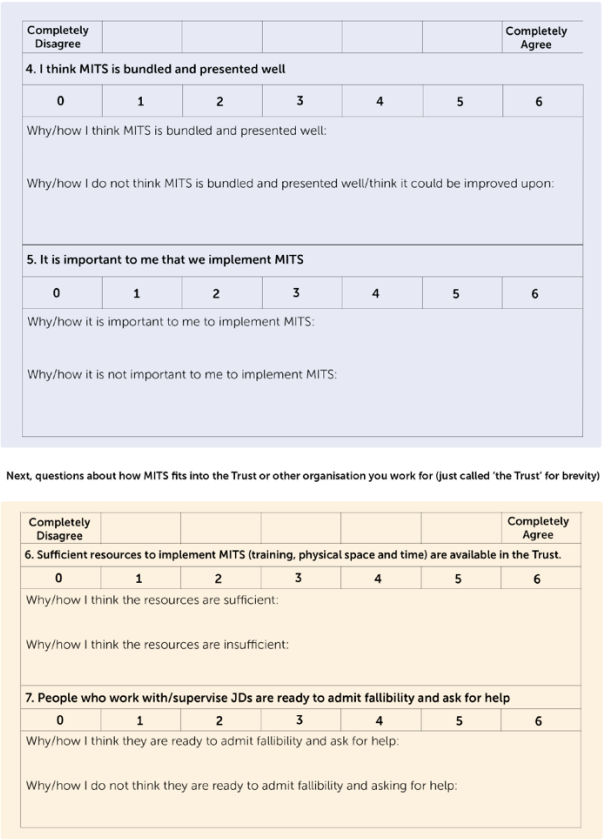
Hospital: Ward / Department: Grade :

Professional Group: Speciality: Sex: Male Female Other / Prefer not to say

Please rate your agreement with these statements from 0 (completely disagree) to 6 (completely agree) by circling the relevant number. Please (optionally) use the spaces provided to explain why; write on the back of the page if necessary

First, questions about what you, personally, think.

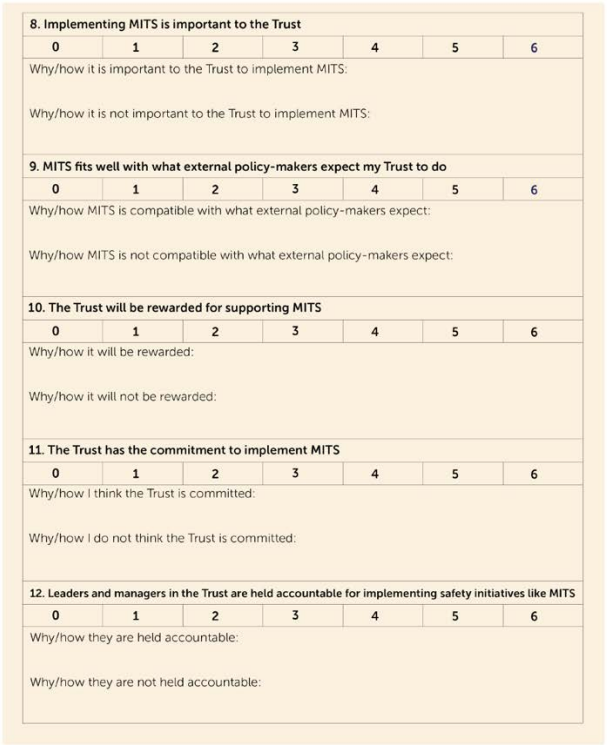
Completely Disagree						Completely Agree
1. I think we need to improve the way we educate junior doctors (JDs) to prescribe insulin						
0	1	2	3	4	5	6
Why/how I think there is a need:						
Why/how I think there is no need:						
2. I find MITS a credible way of educating JDs to prescribe insulin						
0	1	2	3	4	5	6
Why/how I find MITS credible:						
Why/how I do not find MITS credible:						
3. MITS is a better way of educating JDs to prescribe insulin than any other way I know of						
0	1	2	3	4	5	6
Why/how MITS is better than alternatives:						
Why/how MITS is no better or worse than alternatives:						



Completely Disagree						Completely Agree
4. I think MITS is bundled and presented well						
0	1	2	3	4	5	6
Why/how I think MITS is bundled and presented well:						
Why/how I do not think MITS is bundled and presented well/think it could be improved upon:						
5. It is important to me that we implement MITS						
0	1	2	3	4	5	6
Why/how it is important to me to implement MITS:						
Why/how it is not important to me to implement MITS:						

Next, questions about how MITS fits into the Trust or other organisation you work for (just called 'the Trust' for brevity)

Completely Disagree						Completely Agree
6. Sufficient resources to implement MITS (training, physical space and time) are available in the Trust.						
0	1	2	3	4	5	6
Why/how I think the resources are sufficient:						
Why/how I think the resources are insufficient:						
7. People who work with/supervise JDs are ready to admit fallibility and ask for help						
0	1	2	3	4	5	6
Why/how I think they are ready to admit fallibility and ask for help:						
Why/how I do not think they are ready to admit fallibility and asking for help:						



8. Implementing MITS is important to the Trust						
0	1	2	3	4	5	6
Why/how it is important to the Trust to implement MITS:						
Why/how it is not important to the Trust to implement MITS:						
9. MITS fits well with what external policy-makers expect my Trust to do						
0	1	2	3	4	5	6
Why/how MITS is compatible with what external policy-makers expect:						
Why/how MITS is not compatible with what external policy-makers expect:						
10. The Trust will be rewarded for supporting MITS						
0	1	2	3	4	5	6
Why/how it will be rewarded:						
Why/how it will not be rewarded:						
11. The Trust has the commitment to implement MITS						
0	1	2	3	4	5	6
Why/how I think the Trust is committed:						
Why/how I do not think the Trust is committed:						
12. Leaders and managers in the Trust are held accountable for implementing safety initiatives like MITS						
0	1	2	3	4	5	6
Why/how they are held accountable:						
Why/how they are not held accountable:						

Annex 9. Wording of on-line survey of FTs' experiences of CBDs

A member of the MITS Team recently conducted a case-based discussion (CBD) when you debriefed on an experience of prescribing insulin. Will you help us further develop MITS by rating your agreement with several statements, adding comments if you have any? Please do not give the names of any people or confidential clinical information.

What grade are you? FY1 FY2 Other (specify)

Who was the MITS Team member who debriefed you?
Doctor Pharmacist Nurse Patient Other (specify)

Please rate your agreement with these statements; add comments if you have any:
MITS has encouraged me to discuss their insulin treatment with patients
How has it influenced you?

MITS has encouraged me to discuss insulin prescriptions with other staff
How and with whom?

MITS has increased my confidence to prescribe insulin
How has it influenced you?

MITS has helped me deal with uncertainty aroused by prescribing insulin
How has it influenced you?

The SMAC^2 tool has helped me prescribe insulin
How has it influenced you?

The MITS top tips have helped me prescribe insulin
How has it influenced you?

Overall, MITS has helped me prescribe insulin
How has it influenced you?

MITS has influenced aspects of my practice other than prescribing insulin
How has it influenced you?

I would tell a colleague that doing a MITS CBD is worthwhile
Why would you tell them this?

Do you have any comments or criticisms about how the MITS CBD was conducted?
(Where and how it was done, how the debriefer did it, or any other aspect)

Please add any other comments:

Thank you for your help.
The MITS Team