Using the ‘Team Sky’ approach to reduce medication errors among junior doctors

Dr. Rakesh Patel
NIHR Academic Clinical Lecturer in Medical Education,
Department of Medical and Social Care Education, University of Leicester
Honorary Specialist Registrar in Renal Medicine, University Hospitals of Leicester NHS Trust

Dr. William Green
Lecturer in Innovation, Operations and Knowledge Management
School of Management, University of Leicester
Thank you

- Health Education East Midlands
- University of Leicester
- University Hospitals of Leicester NHS Trust
- Leicester Kidney Patient Association
- Patient and Carer Community, Leeds Institute of Medical Education
- Pfizer Pharmaceuticals
- UpToDate®, Wolters Kluwer Health
- Lexicomp®, Wolters Kluwer Health
- BNF on Formulary Complete, Pharmaceutical Press
- StudioCode, Studiocode Business Group
- Anova Technology Ltd
- Hark2
Outline

• Case to contextualise and set the scene
• The wider problem of prescribing and patient safety
• Prescribing interventions
• EPIFFany
  – Effective Prescribing Insight For the Future
• Discussion
Background

- 72-year-old female
  - ESRF on haemodialysis since 2006
  - Left leg DVT – 15 years prior to presentation
  - Type 2 diabetes
  - Hypertension
  - Hypothyroidism
  - Hysteroscopy and polipectomy 1 week prior to admission

- 4 day history of shortness of breath and cough
  - Yellow sputum
  - Streaks of blood
  - Left sided chest pain

- Fever at presentation but otherwise observation trends and examination was normal
Questions raised but never answered

1. Could the pulmonary embolus have been diagnosed earlier?

2. To what extent does the poor monitoring and maintainence of an appropriate INR constitute a prescribing error?
Rationale

- Government pledge to reduce avoidable harm in the NHS from activities such as poor prescribing to save an extra 6000 lives each year.
- The National Patient Safety Agency (NPSA) estimates avoidable harm from medication errors cost more than £750 million each year in England.
- The GMC’s EQUIP study suggested junior doctors were more likely to make prescriptions errors compared to other healthcare professionals.
What is a prescribing error?

- “An unintentional significant (1) reduction in the probability of treatment being timely and effective or (2) increase in the risk of harm when compared with generally accepted practice.”

Prescribing errors

- Affect 7% of medication orders
- Contribute to 2% of patient days and 50% of hospital admissions\(^1,2\)

Prescribing errors and junior doctors

- 124,260 prescriptions made by Foundation doctors across 19 hospitals over seven days contained 11,077 (8.9% of all prescriptions) errors\(^1\)
  - Foundation Year doctors were twice as likely as consultants to make a prescribing error
  - New prescribers (i.e. nurses and pharmacists) had similar error rates to consultants

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\(^1\) An in depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education. The EQUIP Study, The General Medical Council 2009. www.gmc-uk.org
Interventions
Do educational interventions improve prescribing by medical students and junior doctors? A systematic review

Sarah Ross & Yoon K Loke

University of Aberdeen, Aberdeen and *University of East Anglia, Norwich, UK

WHAT IS ALREADY KNOWN ABOUT THIS SUBJECT
• Recent studies have identified a problem with prescribing errors in hospitals.
• It is unclear to what extent educational interventions improve prescribing performance.

WHAT THIS STUDY ADDS
• A wide range of interventions have been tested, but most of them have been on small numbers of participants in single centres.
• The most widely tested intervention, with the greatest number of randomized controlled trials, is the WHO Good Prescribing Guide, which has demonstrated efficacy in international settings across a wide range of students.
• Further work is needed to produce high-quality educational interventions and robust evaluations.

Our aim was to review systematically the literature on educational interventions to improve prescribing by medical students and junior doctors. MEDLINE, EMBASE, Educational Resource Information Center, British Education Index, PsycINFO, CINAHL, TELNIT, Cochrane Trials Database and grey literature were searched. Inclusion criteria were: educational interventions to improve medical student and/or junior doctors’ prescribing in primary or secondary care settings, and published after 1990. After screening 3189 records, we retrieved 11 controlled and four ‘before-and-after’ trials. Ten controlled trials showed improvements in the scores of the intervention group on written scenarios or clinical examination stations, but one study in junior doctors showed no effect on real-life prescription errors. Only one intervention [the World Health Organization (WHO) Good Prescribing Guide in six randomized trials] had been tested in a variety of international settings and across a range of students at different levels. All four ‘before-and-after’ trials reported significant improvements in written tests or clinical stations. However, most studies tested only small numbers of participants and were affected by a range of methodological flaws. There is only moderate evidence in the literature to inform medical schools about how to prepare medical students for the challenges of prescribing. The WHO Good Prescribing Guide is the only model that has been widely used and shown to improve prescribing. Although it is based on sound principles, there is a need for further development. Robust methods of assessment are required to show clearly whether particular teaching interventions are successful.
Educational interventions to improve prescribing competency: a systematic review

Gitta Kamarudin, Jonathan Penn, Betty Chaar, Rebekah Moles

ABSTRACT
Objective: To review the literature on educational interventions to improve prescribing and identify educational methods that improve prescribing competency in both medical and non-medical prescribers.

Design: A systematic review was conducted. The databases Medline, International Pharmaceutical Abstracts (IPA), EMBASE and CINAHL were searched for articles in English published between January 1990 and July 2013.

Setting: Primary and secondary care.

Participants: Medical and non-medical prescribers.

Intervention: Education-based interventions to aid improvement in prescribing competency.

Primary outcome: Improvements in prescribing competency (knows how) or performance (shows how) as defined by Miller’s competency model. This was primarily demonstrated through prescribing examinations, changes in prescribing habits or adherence to guidelines.

Results: A total of 47 studies met the inclusion criteria and were included in the systematic review. Studies were categorised by their method of assessment, with 29 studies assessing prescribing competence and 27 assessing prescribing performance. A wide variety of educational interventions were employed, with different outcome measures and methods of assessment. In particular, six studies demonstrated that specific prescribing training using the WHO Guide to Good Prescribing increased prescribing competency in a wide variety of settings. Continuing medical education in the form of academic detailing and personalised prescribing feedback also yielded positive results. Only four studies evaluated educational interventions targeted at non-medical prescribers, highlighting that further research is needed in this area.

Conclusions: A broad range of educational interventions have been conducted to improve prescribing competency. The WHO Guide to Good Prescribing has the largest body of evidence to support its use and is a promising model for the design of targeted prescribing courses. There is a need for further development and evaluation of educational methods for non-medical prescribers.

ARTICLE SUMMARY

Article focus
- Prescribing competencies that cover both medical and non-medical prescribers have been developed internationally.
- A review of the educational interventions designed to improve prescribing competencies will help to ensure evidence-based interventions are used to develop competent medical and non-medical prescribers.

Key messages
- The WHO Guide to Good Prescribing has the largest body of evidence supporting its use to improve prescribing competencies internationally.
- Few studies have focused on educational interventions for non-medical prescribers.
- There is a need for further development and evaluation of educational methods for non-medical prescribers.

Strengths and limitations of this study
- Timely systematic review considering international developments regarding non-medical prescribers.
- Difficult to generalise findings considering different methods of assessments used.
- Limited to publications in English only.

INTRODUCTION
Prescribing, a complex process involving the initiation, monitoring, continuation and modification of medication therapy, demands a thorough understanding of clinical pharmacology as well as the judgement and ability to prescribe rationally for the benefit of patients. The rational prescribing of medicines as defined by the WHO is “the situation in which patients receive medications appropriate to their clinical needs, in doses that meet their own individual requirements for a sufficient length of time, with the lowest cost to them and their community.” Equipping prescribers with skills for rational prescribing is essential.
Interventions

<table>
<thead>
<tr>
<th>Type of intervention</th>
<th>Number of interventions</th>
<th>%</th>
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<tbody>
<tr>
<td>Educational materials:</td>
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<tr>
<td>Distribution of published or printed recommendations for clinical care, including</td>
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<tr>
<td>clinical practice guidelines, audiovisual materials and electronic publications</td>
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<td>28</td>
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<td>Conferences and training:</td>
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<td>Participation of health care providers in conferences, lectures, workshops or</td>
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<td>traineeships outside their practice settings. Practice settings are defined as on</td>
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<td>the ward or in their office. But could be taking place in a room on the hospital</td>
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<td>site.</td>
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<td>Audit and feedback:</td>
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<td>Any summary of clinical performance of health care over a specified period, with or</td>
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<td>without recommendations for clinical action. The information can have been obtained</td>
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<td>from medical records, computerised databases or patients or by observation including</td>
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<td>a knowledge test.</td>
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<td>Outreach visits:</td>
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<td>Use of a trained person who meets with providers in their practice settings to</td>
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<td>provide information. The information given may include feedback on the providers</td>
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<td>performance. Practice settings are defined as on the ward or in their office. But</td>
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<td>could be taking place in a room on the hospital site.</td>
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<td>Reminders:</td>
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<tr>
<td>Any intervention (manual or computerised) that prompts the health care provider to</td>
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<td>perform a clinical action. Examples include concurrent or inter-visit reminders to</td>
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<td>professionals about desired actions such as screening or other preventative</td>
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<td>measures, enhanced laboratory reports or administrative support (e.g. follow-up</td>
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<td>appointment systems or stickers on charts, order forms or physician order entry</td>
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<td>Marketing:</td>
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<td>Use of personal interviewing, group discussion (focus groups) or a survey of</td>
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<td>targeted providers to identify barriers to change and the subsequent design of an</td>
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<td>intervention and refinement.</td>
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<td>Patient-mediated interventions:</td>
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<td>Any intervention aimed at changing the performance of health care providers for</td>
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<td>which information was sought from or given directly to patients by others (e.g.</td>
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<td>direct mailings to patients, patient counselling delivered by others or clinical</td>
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<td>information collected directly from patients and given to the provider)</td>
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<td>Local opinion leader:</td>
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<td>Use of providers explicitly nominated by their colleagues to be educationally</td>
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<td>influential.</td>
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<tr>
<td>Total</td>
<td>157</td>
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</table>

Brennan, N; Mattick, K. A systematic review of educational interventions to change behaviour of prescribers in hospital settings, with a particular emphasis on new prescribers. BJCP 2012;75:2: 359-72
Prescribing

• What is it?
Prescribing

• The task of writing or ordering a prescription
• The skills necessary for completing prescribing tasks
• The behaviours required for safe prescribing
<table>
<thead>
<tr>
<th>MEDICINE (approved name)</th>
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<th>SPECIAL INSTRUCTIONS</th>
<th>PHARMACIST</th>
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**CODE FOR DRUG OMISSIONS**
When drug is not administered, record the appropriate number in the box, circle and sign. Orders to be informed at discretion of nurse.
Prescribing

• The task of writing or ordering a prescription
• The skills necessary for completing prescribing tasks
• The behaviours required for safe prescribing
Prescribing

‘Prescribing’ is used to describe many related activities, including supply of prescription only medicines, prescribing medicines, devices and dressings on the NHS and advising patients on the purchase of over the counter medicines and other remedies. It may also be used to describe written information provided for patients (information prescriptions) or advice given\(^1\).

Prescribing

• The task of writing or ordering a prescription
• The skills necessary for completing prescribing tasks
• The behaviours and environmental support required for safe prescribing
Current perceived environmental support

- “I knew I should've looked it up cos I didn’t really know it, but I, I think I just convinced myself I knew I because I felt it was something that I should've known....because it is very easy to get caught up in, in being, you know, ‘Oh I'm a Doctor now, I know stuff,’ and with the pressure of people who are maybe, sort of, a little bit more senior than you thinking ‘what’s wrong with him...you don’t wanna always be seen to be in, you know, ‘what’s the dose of paracetamol?’” Interviewee 2 (medical school H)
Current absence of safe behaviours associated with prescribing

- The *notion of ‘safety’ was conspicuous by its absence* from FY respondents’ discourses of their prescribing errors, the reported culture of their working environments, and the reported actions of other doctors\(^1\)

- When lack of knowledge led to errors, those errors might have been prevented by *better support in the working environment*\(^1\)

- *‘Just-in-time’ education* in practical prescribing during the FY1 year, when offered, was valued by trainees and more would have been appreciated\(^1\)

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\(^1\) An in-depth investigation into causes of prescribing errors by foundation trainees in relation to their medical education. The EQUIP Study, The General Medical Council 2009. www.gmc-uk.org
Aggregation of marginal gains

- A new age solution for an age old problem?
- “The whole principle came from the idea that if you broke down everything you could think of that goes into riding a bike, then improved it by 1%, you will get a significant increase when you put them all together”.
Aggregation of marginal gains

Gastone Nencini (Italy) 1960

Bradley Wiggins (2012)
Aggregation of marginal gains

• Wilhelm Steinitz described the gradual gain of advantages that are not decisive individually but collectively may be so.

• Been considered in anaesthesia.

• Improvements already made but where to go next?
Human factors

• “Human Factors is the scientific discipline concerned with the understanding of interactions among humans & other elements of a system, & the profession that applies theory, principles, data & methods to design in order to optimise human well-being & overall system performance” (IEHF, UK)

• “Enhancing clinical performance through an understanding of the effects of teamwork, tasks, equipment, workspace, culture, organisation on human behaviour & abilities, & application of that knowledge in clinical settings” (CHFG, UK).
Prescribing as a task
20. In Consent: patients and doctors making decisions together, we say:

- 3. For a relationship between doctor and patient to be effective, it should be a partnership based on openness, trust and good communication. Each person has a role to play in making decisions about treatment or care.

21. Together with the patient,* you should make an assessment of their condition before deciding to prescribe a medicine. You must have or take an adequate history, including:

- a. any previous adverse reactions to medicines
- b. recent use of other medicines, including non-prescription and herbal medicines, illegal drugs and medicines purchased online, and
- c. other medical conditions.

22. You should encourage your patients to be open with you about their use of alternative remedies, illegal substances and medicines obtained online, as well as whether in the past they have taken prescribed medicines as directed.

23. You should identify the likely cause of the patient's condition and which treatments are likely to be of overall benefit to them.

24. You should reach agreement with the patient on the treatment proposed, explaining:

- a. the likely benefits, risks and burdens, including serious and common side effects
- b. what to do in the event of a side effect or recurrence of the condition.

- c. how and when to take the medicine and how to adjust the dose if necessary, or how to use a medical device
- d. the likely duration of treatment
- e. arrangements for monitoring, follow-up and review, including further consultation, blood tests or other investigations, processes for adjusting the type or dose of medicine, and for issuing repeat prescriptions.

25. The amount of information you give to each patient will vary according to the nature of their condition, the potential risks and side effects and the patient's needs and wishes. You should check that the patient has understood the information, and encourage them to ask questions to clarify any concerns or uncertainty. You should consider the benefits of written information, information in other languages and other aids for patients with disabilities to help them understand and consider information at their own speed and to retain the information you give them.

26. You should also provide patients' carers with information about the medicines you prescribe, either with the patient's consent or, if the patient lacks capacity to consent, if it is in their best interests.

27. It is sometimes difficult, because of time pressures, to give patients as much information as you or they would like. To help with this, you should consider the role that other members of the healthcare team, including pharmacists, might play. Pharmacists can undertake medicines reviews, explain how to take medicines and offer advice on interactions and side effects. You should work with pharmacists in your organisation and/or locality to avoid the risks of overburdening or confusing patients with excessive or inconsistent information.

* or, where appropriate, parents or carers with authority to make decisions on behalf of patients. Medicines may be prescribed without consent if it is likely to be in the best interest of the patient who lacks capacity, or in accordance with mental health legislation.

† A number of patient decision aids are available on the National Prescribing Centre website (www.npc.nhs.uk).
Prescribing as a situated task embedded in the process of clinical enquiry
Prescribing as a situated task embedded in the clinical enquiry from the SRL perspective
Prescribing as a situated task embedded in the clinical enquiry from the SRL perspective.

Clinical Diagnostic Decision-Making Including Prescribing

Knowledge for the task

Clinical Diagnostic Decision-Making including Prescribing

Knowledge for the task

Skill: Gut feeling or a more logical approach

Clinical Diagnostic Decision-Making including Prescribing

Knowledge for the task

Self-regulation of ‘Skill’ and ‘Self’

Skill: Gut feeling or a more logical approach

‘Self’ (Confidence Motivation)
Situated in context

Clinical Diagnostic Decision-Making including Prescribing

Knowledge for the task

Self-regulation of ‘Skill’ and ‘Self’

Skill: Gut feeling or a more logical approach

‘Self’ (Confidence Motivation)

Situated in context

- Authentic ‘Real-life’ with sufficient challenge
- Self-regulation of ‘Skill’ and ‘Self’
- Knowledge for the task
- Skill: Gut feeling or a more logical approach
- Responsible ‘Real’ decision to do something
- ‘Self’ (Confidence Motivation)

Clinical Diagnostic Decision-Making including Prescribing

Teaching prescribing as a situated task embedded in the clinical enquiry from the SRL perspective
http://pixshark.com/zone-of-proximal-development-infographic.htm
Planning & Audit

Feb - Mar

Control Study - no intervention
Rotation cohort A

Apr - Jul

Error rates, Error severity, Medication error types

Aug - Nov

Error rates, Error severity, Medication error types

Intervention - Blended learning
Rotation cohort B

Analyses & reporting

Dec - Jan

Simulation
Simulation
Simulation
Simulation
Simulation

eLearning
Face-to-face Teaching and Feedback
Clinical Decision Support

Error rates, Error severity, Medication error types
Error rates, Error severity, Medication error types
Planning & Audit

<table>
<thead>
<tr>
<th>Feb - Mar</th>
<th>Apr - Jul</th>
<th>Aug - Nov</th>
<th>Dec - Jan</th>
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<tr>
<td></td>
<td>Control Study - no intervention Rotation cohort A</td>
<td>Intervention - Blended learning Rotation cohort B</td>
<td>Analyses &amp; reporting</td>
</tr>
</tbody>
</table>

- Competence
- Performance
- Safe behaviours and Attitudes
- Change
- Usefulness and usability Focus Group
- Return on Investment QALY

Health Education East Midlands
University Hospitals of Leicester
NHS Trust
Pauline
56 years old

Reflective Thinking (3/4)

1. To what extent do you feel you have done everything correctly so far (0-100)

2. What mistakes do you think you have made so far? If so, what are they?

3. What do you need to do to achieve a satisfactory outcome for the management of this case?
SUMMARY AND RECOMMENDATIONS

Triple oral antithrombotic therapy (TOAT) with dual antiplatelet therapy (DAPT) and oral anticoagulant (OAC), compared to less intense antithrombotic therapy, improve cardiovascular outcomes in many coronary artery disease patients who have indications for both. However, TOAT is associated with more frequent episodes of bleeding than less aggressive antithrombotic therapies. The challenge to clinicians and their patients is to balance the benefits and risks of TOAT. Strategies to reduce the likelihood of bleeding, including appropriate dosing and duration of therapy, are discussed above. (See ‘Bleeding’ above.)

There are two broad indications for DAPT in patients with coronary artery disease: coronary artery stenting (to prevent stent
Competence

Significant change in the competence of junior doctors for prescribing from the start to the end of the rotation in the intervention group ($p<0.05$)
10,394 prescriptions across four wards on the renal unit over 8 months

368 (3.5% of all prescriptions) contained an error
Performance

- 20,543 prescriptions across four wards on the renal unit over 8 months
- 542 (2.6% of all prescriptions) contained an error
Significant acceleration in prescribing performance of novices in the intervention cohort compared to more experienced peers in the control cohort.
Significant reduction in the errors across categories of severity across all prescribers.
**Competence, Performance & Safe Behaviour**

<table>
<thead>
<tr>
<th>Competence</th>
<th>No change in clinical notes</th>
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</thead>
<tbody>
<tr>
<td>Performance</td>
<td>34% decrease in drug chart</td>
</tr>
<tr>
<td>Safe behaviour change</td>
<td>Under-performing compared to both the control and intervention groups following ePIFFany</td>
</tr>
</tbody>
</table>

**Engagement**

- **Aug**: A Simulation
- **Sept**: B* eLearning & mLearning
- **Oct**: C Face-to-Face feedback Clinician
- **Nov**: D Face-to-Face Pharmacist education
- **Dec**: A Simulation

**Low-engager**

- Participated in both Simulations
- Attended one clinical feedback and education sessions
- No pharmacy feedback and education sessions

**High-engager**

- High engager with CDS
- Attended two clinical feedback and education sessions
- Attended two pharmacy feedback and education sessions

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It’s really worth, I think, doing something like that, and going to have some feedback from a specialist who can actually guide you on what you have missed and you know... what you can improve, brilliant... yeah

Health Education East Midlands
“(I use) mostly BNF online (and) BNF paper copy...I’ve used UpToDate a few times...on the computer, but I don't use it as much, that often, to be honest”

“I've got a drug question I go to BNF... but if I've got a question about a condition I go to UpToDate... so... and then... the problem is though... I mean when you are working in a big Trust really... you should be following clinical guidelines that are available so... it's actually... I tend to actually go to the... Insite... and use that... but I find that [difficult] to use...”

Low-engager
Low-performer

High-engager
High-performer
“I don’t what is was but the second group seemed better at greetings and goodbyes ... A conversation with patients about their [medication] should have a beginning, middle and end. I know it’s a little thing but it makes a big difference”

Dr. Margaret Ince, Past Chair, Leicester Kidney Patients Association