Institution: University College London

Unit of Assessment: 3- Allied Health Professions, Dentistry, Nursing and Pharmacy

Title of case study: Reducing medication errors by research-led improvements to frameworks and policies for safer use of medication in hospitals

Period when the underpinning research was undertaken: January 2000-present

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
Bryony Dean Franklin (*nee* Dean)	Clinical Senior Lecturer 2000-2004 Visiting Professor in Medication Safety; 2000-2007 Professor 2007- present	2000-2007 (0.2FTE; School of Pharmacy) October 2007 to present (inc. UCL merger with School of Pharmacy, 2012; 0.2FTE)

Period when the claimed impact occurred: 2013 to present

Is this case study continued from a case study submitted in 2014? No

1. Summary of the impact (indicative maximum 100 words)

Franklin's research into the frequency, types and causes of medication errors and development of strategies to prevent them has led to changes in clinical practice, guidelines and policy, both locally and nationally. This includes: a) increasing the feedback provided to prescribers about their prescribing errors, resulting in an estimated 18% reduction in errors, b) introducing caution via guideline development around use of smart infusion pumps to administer intravenous medication to hospital inpatients, and c) facilitating self-administration of medication by hospital inpatients, thereby increasing patient autonomy and engagement. Her work has also informed medical educational practice and has influenced international health policy via the World Health Organization.

2. Underpinning research (indicative maximum 500 words)

Franklin's research focuses on enhancing the safety of the use of medicines in practice by healthcare professionals, patients and carers.

Prescribing errors in hospitals and the role of feedback.

Franklin was one of the first in her field to explore the prevalence, nature and causes of prescribing errors by UK hospital inpatients, using methods such as observational studies, focus groups, interviews and questionnaires. A qualitative study by Franklin published in the Lancet in 2002 [**R1**] was ground-breaking at the time in exploring the causes from the perspectives of the prescribers involved, as well as using a theory of human error to understand the causes and contributing factors at the individual, team, and wider organisational levels. Further studies in different hospitals, using both paper-based and electronic prescribing, confirmed that lack of feedback to prescribers was a contributing factor and thus a potential area for intervention [**R2**]. This was partly because pharmacists (and others who identified errors) were not always able to identify or contact the original prescriber, and partly because even if such conversations took place, they were often framed as "changing the prescription" rather than "an error has occurred – how can we prevent it reoccurring?". Franklin's research then moved to exploring the acceptability of different approaches to receiving feedback [**R3**]. This revealed that, in general, doctors did not feel threatened by feedback on their errors. Instead, they felt that feedback was constructive, but irregular and insufficient, with both pharmacists and prescribers preferring individual feedback with additional generic feedback on common or serious errors.

Safe infusion of intravenous medication in hospital inpatients.
Together with the UCL Interaction Centre, Franklin conducted the largest observation-based study of the safety of intravenous infusions to date, observing infusion administration in 16 English hospital trusts [**R4**, **R5**]. Errors were observed in 231 of 2,008 infusions (11.5%), of which 23 (1.1% of all infusions) were potentially harmful. Types and prevalence of errors varied widely among trusts, as did local policies. 'Smart' infusion pumps incorporating dose error reduction software, although widely advocated, had little effect with similar error rates observed in infusions given via smart pump versus any other pump (10.3% vs 10.8%; p=0.8).

Patient involvement in supporting medication safety.
Despite a growing focus on the importance of patient and carer involvement with healthcare, there has been little work on how best to involve them in the inpatient setting. Franklin therefore led research to explore how inpatients (and their carers) engaged with medication safety in two UK hospital trusts, the facilitators and barriers to this engagement, and how involvement may be affected by electronic prescribing [**R6**]. This incorporated extensive patient and public involvement, with lay members of the team also collecting data and contributing to its analysis, bringing complementary perspectives to those of healthcare researchers. Patient involvement in medication safety was found to be very limited, with patients shown their medication records in only 4 (2%) of 247 cases. Many patients wanted to be able to administer their own medication and felt this would have safety benefits but were unaware that this was possible.

3. References to the research (indicative maximum of six references)

R1. Dean B, Schachter M, Vincent C and Barber N (2002). Causes of prescribing errors in hospital inpatients: a prospective study. *Lancet* 359: 1373-8. https://doi.org/10.1016/S0140-6736(02)08350-2.

R2. Franklin BD, Reynolds M, Shebl NA, Burnett S, Jacklin A (2011). Prescribing errors in hospital inpatients: a three-centre study of their prevalence, types and causes. *Postgrad Med J*;87:739-745. http://dx.doi.org/10.1136/pgmj.2011.117879.

R3. Bertels J, Almoudaris AM, Cortoos P-J, Jacklin A and Franklin BD (2013). Feedback on prescribing errors to junior doctors: exploring views, problems and preferred methods. *International Journal of Clinical Pharmacy* 35:332–338. https://doi.org/10.1007/s11096-013-9759-y.

R4. Lyons I, Furniss D, Blandford A, Chumbley G, Iacovides I, Wei L, Cox A, Mayer A, Vos J, Galal-Edeen G, Schnock KO, Dykes PC, Bates DW, Franklin BD (2018). Errors and discrepancies in the administration of intravenous infusions: a mixed methods multihospital observational study. *BMJ Quality and Safety* 27:892-901. http://dx.doi.org/10.1136/bmjqs-2017-007476.

R5. Furniss D, Lyons I, Franklin BD, Mayer A, Chumbley G; Wei L, Cox A, Vos J, Galal-Edeen G; Blandford A (2018). Procedural and documentation variations in intravenous infusion administration: A mixed methods study of policy and practice across 16 hospital trusts in England. *BMC Health Services Research* 18:270. https://doi.org/10.1186/s12913-018-3025-x.

R6. Garfield S, Jheeta S, Husson F, Lloyd J, Taylor A, Boucher C, Jacklin A, Bischler A, Norton C, Hayles R, Franklin BD (2016). The role of hospital inpatients in supporting medication safety: A qualitative study. *PLOS One:* April 19, 2016. http://dx.doi.org/10.1371/journal.pone.0153721

4. Details of the impact (indicative maximum 750 words)

Franklin's research has had wide-ranging national and international impact on medication safety, including quality improvement projects, policy and educational practice.

Using feedback to reduce prescribing errors.
In 2013, Franklin led a quality improvement project at Imperial College Healthcare NHS Trust (ICHT) to develop, implement and evaluate a trifold approach to providing feedback to hospital prescribers [**S1**]. Based on her earlier research [**R3**], this comprised providing name stamps for

junior doctors who were encouraged to stamp/write their name clearly when prescribing, introducing principles of effective feedback to support pharmacists providing feedback on prescribers' individual errors, and fortnightly 'prescribing tip' emails that addressed a common and/or serious error. Evaluation demonstrated an increase in medication orders for which junior doctors stated their name (from 10% to 50%) as well as significant improvement in pharmacists' perceptions of the overall effectiveness of feedback provision (p=0.03) [**S1**]. [TEXT REDACTED FOR PUBLICATION, **S2**].

This initial project suggested that wider rollout could bring widespread improvement to error rates. A toolkit was developed, describing how to introduce the Prescribing Improvement Model (PIM) to help reduce prescribing errors made by Foundation Year 1 hospital doctors. This comprised practical guidance derived from Franklin's research [**R3**] as previously described, plus an accompanying video [**S3**]. Data on prescribing errors collected by seven participating hospitals, including the Royal Marsden and London North West University Healthcare NHS Trust, suggested a statistically significant reduction in prescribing errors from 11% to 9% (p=0.003), a relative reduction of 18% [**S4**]. Testimonials indicated that this work has had "a significant impact on improving patient safety", has been incorporated into junior doctor training, and has resulted in amendment of clinical pharmacy guidelines, as well as being used as a model for learning at the London North West University Healthcare NHS Trust [**S5**].

Avoiding reliance on 'smart' pumps to reduce errors in intravenous infusions.
Franklin and colleagues' research [**R4**] raised key questions that challenged the prevailing view that 'smart' infusion pumps are the solution for intravenous medication errors. In January 2019, Franklin was asked to participate in a UK Parliamentary round table event, 'Meeting the Medication Error Challenge', with NHS England, the Care Quality Commission and the Medicines and Healthcare Products Regulatory Agency, to consider the role of smart pumps. At this event, she advised that these pumps were not a panacea, that the evidence for their benefits was not yet clear and that local evaluation is essential [**S6**]. Supporting this stance, Franklin's research was also used by the Healthcare Safety Investigation Branch (HSIB, responsible for conducting independent investigations of patient safety concerns in NHS-funded care across England) in their investigation of the procurement, usability and adoption of 'smart' infusion pumps [**S7**]. A testimonial from HSIB clearly links [**R4**] to the development of key recommendations in the report, stating: [TEXT REDACTED FOR PUBLICATION, **S7**].

Improving inpatient experience through self-administration.
Franklin's research [**R6**] has informed the revision of policies on self-administration of medication and associated patient-facing materials (including patient leaflet '*Keeping and administering your medicines in hospital*') to encourage this type of practice [**S8**]. Building upon Franklin's findings, a quality improvement project at Imperial College Healthcare NHS Trust demonstrated an increase in self-administration from 41% (64/155) to 66% (78/118) of patients [**S9**]. In 2019, the NHS Specialist Pharmacy Services repository of good practice for all English NHS organisations also cited this work for increasing the availability of self-administration as well as raising professionals' awareness of patients' ability to self-administer [**S10**].

Influence on medical practice.
Franklin has been the lead author on the 2020 revision of the World Health Organization's (WHO) Multi Professional Patient Safety Curriculum Guide to form a separate Inter-Professional Medication Safety Curriculum Guide [**S11**]. The current version is widely used to guide undergraduate and post-qualification training of healthcare professionals around the world, particularly in lower and middle income settings, and is available in ten languages. The revised WHO guide refers to Franklin's work in making recommendations around giving feedback on errors, supporting patient and carer involvement in medication safety, and the need to be aware of the unintended consequences of technologies. As an example in practice, and in addition to the implementation of the Prescribing Improvement Model (PIM) within Imperial College Healthcare NHS Trust, PIM has formed the basis of teaching at Imperial College London Medical School [**S12**], where it was noted the importance of "real life examples of mistakes …they capture the attention of the students who want to avoid mistakes". PIM has also been adopted as far away as

Taranaki District Health Board Hospitals in New Zealand [**S12**] as an 'alternative electronic method' to specifically target areas of best practice that can be further optimised [**S12**], and received positive feedback from prescribers who found the PIM's specific examples of prescribing best practice to be concise and educational.

5. Sources to corroborate the impact (indicative maximum of 10 references)

[S1] Reynolds M, Jheeta J, Sanghera I, Jacklin A, Ingle D, Franklin BD (2017). Improving feedback on junior doctors' prescribing errors: mixed methods evaluation of a quality improvement project. *BMJ Quality and Safety*, 26: 240-247. http://dx.doi.org/10.1136/bmjqs-2015-004717

[S2] Reference to feedback on errors in the CQC report for Imperial College Healthcare NHS Trust, January 2018, "Well led" section.

[S3] https://www.health.org.uk/improvement-projects/improving-patient-safety-through-feedback-on-prescribing-errors [accessed 20 November 2019]

[S4] Sanghera I, Bell H, Jheeta S and Franklin BDF (2017). Reducing prescribing errors through better feedback: A collaborative study across North West London hospitals. Poster presented at the International Forum on Quality and Safety in Healthcare, London, 27-28 April.

[S5] Testimonial from Deputy Chief Pharmacist, London North West University Healthcare NHS Trust.

[S6] Meeting the Medication Errors Challenge: A strategy to reduce IV infusion medication errors. Parliamentary round table hosted by Nigel Mills MP, 31 January 2019. Report available on request.

[S7] Healthcare Safety Investigation Branch. Procurement, usability and adoption of 'smart' infusion pumps [ongoing]. https://www.hsib.org.uk/investigations-cases/smart-pumps/ [accessed 20 November 2019];Testimonial from Health Services Investigation Branch

[S8] Imperial College Healthcare NHS Trust. *Keeping and administering your medicines in hospital*. Patient information leaflet 2019.

[S9] Garfield S, Bell H, Nathan C, Randall S, Husson F, Boucher C, Taylor A, Lloyd J, Backhouse A, Ritchie L, Franklin BD (2018). A quality improvement project to increase self-administration of medicines in an acute hospital. *International Journal for Quality in Healthcare*, 30(5); 396-407. https://doi.org/10.1093/intqhc/mzy035

[S10] The NHS Specialist Pharmacy Service https://www.sps.nhs.uk/articles/a-quality-improvement-project-to-increase-self-administration-of-medicines-in-an-acute-hospital/ [accessed 20 November 2019]

[S11] World Health Organization, Multi Professional Patient Safety Curriculum Guide 2020: Course 11 Improving Medication Safety. https://www.who.int/teams/integrated-health-services/patient-safety/guidance/curriculum-guide-tools/docs/default-source/integrated-health-services-(ihs)/psf/curriculum-guide/resources/ps-curr-handouts/course11_handout_Improving-medication-safety

[S12] Testimonials from Imperial College Healthcare NHS Trust and New Zealand hospitals regarding PIM.