Implementing an Electronic Prescribing and Medicines Administration System: A Good Practice Guide
Background

The commission and good practice guide

A Scottish Government scoping exercise undertaken in NHSScotland in 2012 highlighted key barriers to implementing electronic prescribing and medicines administration systems; one of which was an understanding of the clinical risks associated with an inadequate system or poor implementation. Engagement with NHS boards also identified clear enthusiasm for electronic prescribing and medicines administration and recognition that it is an essential component of the electronic patient record.

These three factors led the Scottish Government to fund a commission to develop a resource to support the consistent and safe implementation of electronic prescribing and medicines administration systems in NHSScotland. The work of this commission, led by Healthcare Improvement Scotland, is complementary to that of another Scottish Government commission, ‘Improving the electronic exchange of patient information between primary and secondary care’ (Closing the Loop).

Healthcare Improvement Scotland worked with a consortium of NHS boards to produce the Implementing an Electronic Prescribing and Medicines Administration System: a Good Practice Guide. The commission was overseen by:

- a project board with responsibility for overall project governance and accountability to the safer medicines working group, a sub-group of the eHealth strategy board
- a reference group who acted as a support to the core commission team in their delivery of the commission tasks and objectives and were accountable to the project board, and
- two academic advisers who provided external expert advice.

The membership and roles and responsibilities of each of these can be found in Appendix 1.
Methodology

Over a four-month period, March–June 2013, multidisciplinary interviews and focus groups were conducted with 87 participants to identify lessons learned and best practice on the implementation of electronic prescribing and medicines administration systems in NHS Ayrshire & Arran and NHS Lanarkshire as well as generic learning from the implementation of a national Chemotherapy Electronic Prescribing and Administration System within the three cancer networks. Other NHS board contacts from within NHSScotland (including management, executive and strategic roles) were also included. The methodology used and participant demographics are shown in Appendices 2 and 3 respectively.

The qualitative data from interviews and focus groups were triangulated with the published literature and local evaluations to generate the recommendations included in this guide. The material prepared was shaped and peer reviewed by the project board, reference group and academic advisers to determine their practicality and usefulness.
About the guide

The guide aims to support the consistent and safe implementation of electronic prescribing and medicines administration systems in Scotland by providing information and tools for a wide multidisciplinary audience.

The information and tools included within the guide will be useful to any healthcare professional involved with electronic prescribing and medicines administration, whether:

- a clinical user of the system
- a member of the implementation team, or
- a member of the senior management team with responsibility for its overall governance.

The guide contains:

- **key messages** – high level statements describing the three key areas identified as being critical to a safe and successful implementation of an electronic prescribing and medicines administration system:
  1. governance and risk management
  2. leadership and organisational change
  3. technology

- **recommendations, self-assessment checklists and action planning tools** for the three key areas

- **five case studies** from within NHSScotland which illustrate different NHS board approaches and experiences to business planning and/or implementing electronic prescribing and medicines administration systems, and

- **benefits realisation** – an exploration of the challenges associated with determining the benefits and cost-effectiveness of electronic prescribing and medicines administration systems.

For more information on the guide or if you have any questions or feedback, please do not hesitate to contact the medicines team, Healthcare Improvement Scotland on 0131 623 4300.
Strategic context

Medicines represent the most frequent healthcare intervention – treatment with medicines save lives, controls and cures diseases and provides symptom control. In NHSScotland, drugs account for 12% of the total NHS spending and in the year 2011-2012, approximately £1.4 billion was spent on drugs, of which £296 million was in the hospital setting. The majority of medicines used in hospitals are prescribed and administered using a traditional paper-based chart system.

However, we know that the safe and effective prescribing and administration of medicines is challenging. In 2001 the Audit Commission reported that as a consequence of medication errors in hospitals (i) the annual cost to the NHS in England and Wales was £500m, and (ii) approximately 1,200 patients die every year in England and Wales. Since 2001 the published literature has reinforced the nature and extent of the problem of medication-related incidents. These incidents impact significantly on medication-related morbidity and mortality and on medicines wastage. Examples include:

- 1 in 10 patients experience a medication error while in hospital
- approximately 7% of hospital admissions are due to medicine-related adverse events, and
- as patients move between different care settings, there is an 18-60% discrepancy in medication on admission to hospital and an 11% discrepancy in discharge medication

There is significant multidisciplinary enthusiasm for the development of hospital electronic prescribing and medicines administration both nationally and globally. NHSScotland Quality and eHealth strategies share the common ambition of delivering safe, effective person-centred care. Recently in Prescription for Excellence, the Scottish Government has endorsed the implementation of electronic prescribing and medicines administration in secondary care to allow for electronic capture of prescribing data and sharing of information for the development of pharmaceutical care. Furthermore in Scotland, the Scottish Patient Safety Programme includes work to reduce the risks associated with high risk medicines and medicine reconciliation in acute adult, primary care, mental health and the maternity and children’s quality improvement collaborative (incorporating maternity care, paediatric care and neonatal care). These programmes have highlighted the need for safe and effective recording and transfer of information on patients’ medicines within and between care settings.
In Scotland, electronic prescribing and medicines administration will be key to delivering these strategies through managing the avoidance of harm and a substantial area of NHS spending. Electronic prescribing and medicines administration systems have the potential to enhance patient safety through:

- reducing the number of transcription, prescribing and administration errors
- providing a sustainable hospital solution to contribute to accurate and efficient medicine reconciliation and communication of medicines information at all points of patient transfer, including on admission and discharge
- greater consistency in clinical practice
- strengthened information governance by providing a robust audit trail
- being a key component of the electronic patient record, and
- the provision of rich patient identifiable data on medicines use in secondary care which can be utilised to manage medicine effectiveness, monitor prescribing patterns, improve clinical practice and patient safety and support clinical research.

The electronic prescribing and medicines administration system (like paper systems) will underpin how medicines governance is delivered within an organisation. Consequently, the directors of pharmacy and area drug and therapeutics committees are crucial in supporting the implementation, maintenance and optimisation of these electronic prescribing and medicines administration systems.

To deliver on the eHealth strategic aim of “improving the safety of patients taking medicines and their effective use”, the vision is for a single, shared medication record that moves with the patient and is kept up to date by the current prescriber. As described in the eHealth strategy 2011-2017, the future state will be where all NHS boards have implemented electronic prescribing and medicines administration systems with integral clinical decision support interfaced with other clinical eHealth systems, including laboratory systems and primary care.

Scotland has strategically committed to the need for electronic prescribing and medicines administration systems which must be as safe as the current paper-based system whilst providing a foundation for improving the safe and effective use of medicines. Therefore, where implemented, hospital electronic prescribing and medicines administration systems need to, as a minimum, safely replace the paper prescribing and administration record currently in use in the majority of hospitals across NHSScotland. The development of a nationally agreed prescribing and administration record has the potential to provide a standard basis on which to build an electronic record. This Scottish standard prescribing and administration recording chart for Scotland (SPARS) is currently in development by the Royal College of Physicians Edinburgh.

An incremental approach to achieving the vision is described in Figure 1. The first incremental step is to safely move from paper to electronic medicines prescribing and administration. The incremental approach thereafter can be discretionary and linked to individual NHS board needs and eHealth priorities.
Transferring from paper to electronic prescribing and medicines administration is the first step in a continuous journey of planning, implementation, development and optimisation. An electronic prescribing and medicines administration system may only be procured and implemented in NHSScotland if it has been successfully tested against the national operational requirements and associated test scripts and must meet the required safety requirements associated with moving from a paper-based to an electronic system. There are national standards for hospital electronic prescribing and medicines administration systems and these are included in Appendix 4.

Figure 1: An incremental approach to hospital electronic prescribing and medicines administration

<table>
<thead>
<tr>
<th>Stage 1 – Replace paper chart</th>
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<td>Safely move from paper prescribing and administration charts to an electronic prescribing and medicines administration system</td>
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<th>Stage 2 – Add decision support and eDischarge</th>
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<tr>
<td>Activate automatic decision support (allergies, drug interactions, therapeutic duplicates)</td>
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<th>Stage 3 – Integrate with other clinical applications and EPR</th>
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<td>Implement rules based decision support linking laboratory and other data</td>
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References


Key messages
Key messages

The key messages are high level statements, based on published evidence and NHSScotland experience, which describe the essential elements for the safe and successful implementation of electronic prescribing and medicines administration systems.

These essential elements are categorised as:

1. Governance and risk management
2. Leadership and organisational change
3. Technology

These elements are underpinned by more detailed supporting information and checklists (see Recommendations section).

The key messages for benefits realisation have also been included.
Governance and risk management

An electronic prescribing and medicines administration system may only be procured and implemented in NHSScotland if it has been:

- successfully tested against the national operational requirements and associated test scripts and
- meets the required safety requirements associated with moving from a paper-based to an electronic system.

The implementation, maintenance and optimisation of electronic prescribing and medicines administration systems is underpinned by robust medicines governance arrangements which are similar to and managed in accordance with medicines governance for non-electronic prescribing and medicines administration and local eHealth governance arrangements.

Leadership from the NHS board’s medical, pharmacy and nursing directors is essential.

Engagement and ownership by the area drug and therapeutics committee is essential.

Formal risk management procedures are in place to identify, report, document and investigate all incidents in relation to electronic prescribing and medicines administration, including the potential risks associated with operating a dual (paper/electronic) system.
Leadership and organisational change

The biggest challenge for the implementation of an electronic prescribing and medicines administration system is not the system itself, but managing behavioural change and helping people adapt to new ways of working.

The implementation of an electronic prescribing and medicines administration system requires organisational ownership and is best effected through multi-professional and clinical leadership from medical, nursing and pharmacy directors, support from a dedicated project management resource, and a project plan. The project plan supports all phases of the implementation and the important transition to ongoing maintenance (business as usual) and improvement and development.

Training for all grades of healthcare professionals required to use the electronic prescribing and medicines administration system is mandatory both before go live date and on an ongoing basis. Organisation-wide support for training is essential and the resource required to organise and deliver training is significant. An agreed training plan is developed which identifies and mitigates the potential risks associated with training. The training plan also outlines who requires training, when and how training will be delivered, and what training materials will be developed.

Effective communication is critical to the success of the implementation of an electronic prescribing and medicines administration system. The project is supported with strong communication based on a communication plan. Managing expectations is part of the communications strategy and engaging and involving all wards and departments and clinical groups and committees is essential. The timing of engagement is critical and starts when the project is being strategically considered.

Significant human resource is required to support users of the electronic prescribing and medicines administration system. This is key for a safe and successful implementation. Of equal importance is the resource allocation to allow ongoing maintenance and development of the system. Continuous clinical, technical and supplier support is required during the initial implementation and also ongoing. This support must be available both in and out of hours 24/7/365, with queries dealt with appropriately to avoid potential risk to patient safety through delay.
Technology

An electronic prescribing and medicines administration system may only be procured and implemented in NHSScotland if it has been:

- successfully tested against the national operational requirements and associated test scripts and
- meets the required safety requirements associated with moving from a paper-based to an electronic system.

The NHS board’s IT infrastructure is invested in, maintained and developed to ensure it is sufficiently robust, reliable, accessible and responsive to support the clinical need associated with a real-time electronic prescribing and medicine administration system.

Electronic prescribing and medicines administration systems must have robust IT infrastructure and support:

- a scalable and sustainable deployment of the electronic prescribing and medicines administration system
- carefully planned integration of the electronic prescribing and medicines administration system with other clinical applications and systems - as a minimum real-time patient admission to the electronic prescribing system is an absolute dependency
- an agreed testing, implementation and maintenance plan
- security arrangements in accordance with local policy, including anti-virus software and firewalls
- each user having a unique username and password which will not be shared (as defined in Statutory Instrument 2008, number 1692 which defines the requirements for prescriptions in electronic form), and
- clinical (medical, nursing and pharmacy) and eHealth teams to work collaboratively to determine the requirements for equipment to ensure there is adequate availability and accessibility to support standardised, but variable clinical processes.

Electronic prescribing and medicines administration is included in hospital business continuity plans and the NHS board view it as a priority to prevent service disruption.
Benefits realisation

NHSScotland experience to date indicates that hospital electronic prescribing and medicines administration systems provide an important foundation for improving the safe and effective use of medicines thereby providing an opportunity to enhance patient safety in both acute and primary care settings.

However, as yet, there is relatively limited published evidence on the benefits of electronic prescribing and medicines administration in improving outcomes for patients. In addition, evaluating the impact of electronic prescribing and medicines administration systems is complex and internationally there is agreement that costs cannot at present be readily ascribed to the benefits of these electronic systems.

NHSScotland supports the approach to benefits realisation that is focused on the broader strategic and quality benefits of electronic prescribing and medicines administration systems linked to NHSScotland policy and strategy. It is expected that this will ultimately accrue financial benefits. NHS board business cases should be based primarily on the safe and effective use of medicines, whilst recognising the potential indirect financial benefits arising from patient, quality and strategic benefits (for example a reduction in medication errors and potential efficiencies in nurse time spent administering medicines).

Considering how progress with implementation will be monitored and evaluated to ensure the benefits are realised and unforeseen or unanticipated consequences are identified is recommended. This will help inform decision-making not only in local NHS boards and across NHSScotland, but also internationally.

While the commission has provided clarity on current evidence and expert opinion on benefits realisation, it will be important to review emerging learning as experience of implementing electronic prescribing and medicines administration systems in NHSScotland grows. It is considered that investment in long term resources for developing and improving electronic prescribing and medicine administration systems will be necessary to realise the anticipated benefits.
Recommendations
Recommendations

Recommendations (with supportive detail), self-assessment checklists and action planning tools are included for the three key areas which have been identified as being critical to a safe and successful implementation of an electronic prescribing and medicines administration system:

1. Governance and risk management
2. Leadership and organisational change
3. Technology

The recommendations and supportive detail were generated by triangulating the qualitative evidence from interviews and focus groups, findings from a literature review and local evaluations from NHS boards and cancer networks. Anonymous, illustrative quotations from participant interviews and focus groups are included. To help the reader interpret the quotations, participants are identified only by either HEPMA (hospital electronic prescribing and medicines administration) or CEPAS (Chemotherapy Electronic Prescribing and Administration Systems) and their discipline (for example HEPMA, pharmacist or CEPAS, doctor).

The recommendations are summarised at the beginning of each of the three key areas. They are then described again with the underpinning supportive detail providing richer information on experiences of lessons learned in NHSScotland.

The recommendations, supportive detail, checklists and action planning tools complement each other and are designed to be used together rather than in isolation.

For convenience and ease of use, the separate checklists have been replicated in Appendix 5 as one complete checklist and action planning tool.
Governance and risk management

Summary of recommendations

Medicines governance in local NHS boards
1.1 The medicines governance arrangements reflect the roles of the director of pharmacy and of the area drug and therapeutics committee in the local NHS board.

Risk management
1.2 Formal risk management processes are in place with a full risk assessment undertaken regularly during implementation to judge the project’s readiness to proceed. Decisions are documented in a risk log.
1.3 The risks associated with operating a dual (paper and electronic) prescribing system are identified and managed.
1.4 The new types of risks to patient safety which the electronic prescribing and medicines administration system may introduce are identified and managed.
1.5 It is stressed that the data generated within the system provides an opportunity to support audit and clinical improvement.
1.6 Secondary use of the data generated by the electronic prescribing and medicines administration systems has potential to optimise patient care.

Clinical decision support
1.7 Users are accountable for clinical decisions.
1.8 It is decided locally how best to use functionality that supports clinical decision-making, with the area drug and therapeutics committee validating decisions and sanctioning prescribing protocols.

Document management
1.9 Up-to-date documents to support training, ‘how to…’ quick reference guides, continuity procedures and change control are easily accessible for all users.
1.10 Documents are adapted to suit local needs.
1.11 Document management includes retention of the implementation plans and risk registers.
1.12 Document control is essential and a scheme of delegation for authorisation is outlined.
Medicines governance in local NHS boards

Recommendation 1.1

The medicines governance arrangements reflect the roles of the director of pharmacy and of the area drug and therapeutics committee in the local NHS board.

Supporting detail

- The “director of pharmacy is responsible for medicines governance”:
  - the refresh of area drug and therapeutics committees (ADTC) published in the New Medicines Review, affirms that the “director of pharmacy is responsible for medicines governance”.

- The ADTC is the “key professional advisory group for medicines governance”:
  - ADTCs within local NHS boards are the “key professional advisory group for medicines governance” and “are key to ensuring that adequate systems and processes relating to medicines governance are in place in local NHS boards”.

- The director of pharmacy and ADTC are essential in supporting the implementation, maintenance and optimisation of electronic prescribing and medicines administration systems:
  - as the director of pharmacy has overall responsibility for medicines governance and the ADTC is the “key professional advisory group for medicines governance”, their roles are essential in supporting the implementation, maintenance and optimisation of electronic prescribing and medicines administration systems.
  - experience has demonstrated that for a safe and successful implementation, the ADTC has been actively engaged at all stages of the process, providing professional advice, support and leadership - this is demonstrated in the case studies from NHS Ayrshire & Arran, NHS Dumfries & Galloway and NHS Lanarkshire.

- Each NHS board has a mechanism to allow medicine and eHealth governance to operate effectively.

- The clinical governance committee oversees the NHS board’s policies, strategies, systems and processes to ensure the safe, effective and person-centred care and services are delivered.

- Refer to ‘clinical decision support’ below for recommendations relating specifically to the role of the ADTC in validating how the clinical decision support functionality and tools are used and sanctioning prescribing protocols.

Risk management

Recommendation 1.2

Formal risk management processes are in place with a full risk assessment undertaken regularly during implementation to judge the project’s readiness to proceed. Decisions are documented in a risk log.

Supporting detail

- Formal risk management procedures must be in place for electronic prescribing and medicines administration as the system presents a considerable culture change.

- The continuous monitoring of risks throughout the project is a vital component of a safe and successful implementation (similar to ‘safety cases’ as recommended by the Health Foundation: www.health.org.uk/publications/using-safety-cases-in-industry-and-healthcare).

- A full risk assessment is undertaken before implementation and regularly thereafter with decisions documented:
  
  - a risk log is developed of both anticipated issues and those arising through the project implementation team.
  
  - a cascade and communication process is agreed.
  
  - routine ward and clinical processes are mapped to recognise and mitigate or control all the risks in advance of implementation, including transfer of patients between paper and electronic wards when operating a dual system, business continuity planning for power failure and training for medical locums and bank nurses.
  
  - risks are minimised and managed through robust systems.
  
  - the risks to the processes which support implementation such as training, user support, engagement and involvement and communication are integrated into the project risk register (see sections in ‘leadership and organisation change’).

- The risks and issues are discussed regularly (for example weekly) during implementation and the project’s readiness to proceed are judged:
  
  - discuss with senior nursing, medical, pharmacy, eHealth and clinical governance and information governance stakeholders.
  
  - consider whether to continue, delay, suspend or stop the implementation.
Recommendation 1.3
The risks associated with operating a dual (paper and electronic) prescribing system are identified and managed.

Supporting detail
- Operating with dual prescribing systems (paper and electronic) generates risks to patient safety.
- Information transfer and transcription of prescriptions as patients transfer between paper and electronic wards and between primary and secondary care interfaces on admission and discharge introduces risks to patient safety.
- Specialist documentation for specific medications (for example warfarin, insulin) may not be replicated on the electronic prescribing and medicines administration system. In these situations, the specialist documentation continues to be used, with place markers on the electronic prescribing and medicines administration system indicating the prescription of the medication.

Recommendation 1.4
The new types of risks to patient safety which the electronic prescribing and medicines administration system may introduce are identified and managed.

Supporting detail
- While it is recognised that electronic prescribing and medicines administration systems can reduce both prescribing and administration errors, errors will still occur and new types of risks to patients safety may be introduced (for example due to automation of prescribing):
  - an awareness of the new types of errors being generated allows clinical and technical teams to determine how best to manage any risks, develop training requirements, and update clinical protocols and guidelines to potentially avoid these in the future.
  - recognise that the system supports clinical care and users should exert care when employing the system.
  - some users may develop a reliance on the system due to the automation of the application and act without questioning. For example, where in the past users may have checked a drug’s dose in the British National Formulary, they may no longer check if uncertain or select a default dose without thought (for example metformin 500mg twice daily is selected when the patient takes alternative dose).
Recommendation 1.5

It is stressed that the data generated within the system provides an opportunity to support audit and clinical improvement.

Supporting detail

- The system is a rich source of data to support audit and clinical improvement.
- Reporting has vast potential and "the limit is your imagination" (HEPMA, pharmacist).
- Most systems will come with a set of standard reports which may or may not meet the needs of end users. It should be possible to customise these reports locally.
- Direct access to the data within electronic prescribing and medicines administration systems should allow localised queries to be generated to meet needs. This is dependent on:
  - system design
  - availability of reporting tools, and
  - in-house knowledge, capability and capacity to understand and extract the required information.
- The data generated in reporting may be used to:
  - track formulary and guideline compliance
  - support financial and strategic management reviews, and
  - provide evidence for investigations (for example dealing with incidents, competency or complaints).

Recommendation 1.6

Secondary use of the data generated by the electronic prescribing and medicines administration systems has potential to optimise patient care.

Supporting detail

- The data generated by electronic prescribing and medicines administration systems provide an opportunity to optimise patient care and act as a lever for change to drive improvements in healthcare delivery.
- Failure to resource this opportunity will have an adverse effect on benefits realisation.
- Secondary uses of the data could include linking prescribing and other data including pharmacovigilance, welfare, legal, education and prescribing pricing considerations.
Clinical decision support

**Recommendation 1.7**

Users are accountable for clinical decisions.

**Supporting detail**

- Remind users that they themselves make clinical prescribing decisions and are accountable for their selections of medicines, not the electronic prescribing and medicines administration system.

**Recommendation 1.8**

It is decided locally how best to use functionality that supports clinical decision-making, with the area drug and therapeutics committee validating decisions and sanctioning prescribing protocols.

**Supporting detail**

- Decide locally how best to use clinical decision support functionality (for example information on drug interactions, therapeutic duplicates and allergies) and ensure the area drug and therapeutics committee validates decisions and sanctions prescribing protocols by:
  
  - considering what functions to activate, why and when.
  
  - a pragmatic approach is taken when deciding which level of support to switch on to avoid apathy to, and irritation from, repeated prompts. Users may become desensitised to a high frequency of alerts (for example decision support activated at relatively low clinical significance may generate more alerts and warnings than prescriptions, some of which will have questionable value in supporting decision-making).

- Consider if prescribing will be protocol driven and whether this would work in all clinical areas:
  
  - speciality prescriptions (for example protocols for steroid reducing doses and helicobacter pylori eradication treatment) can simplify prescribing and may avoid inappropriate prescribing.
Document management

**Recommendation 1.9**

Up-to-date documents to support training, ‘how to...’ quick reference guides, continuity procedures and change control are easily accessible for all users.

**Supporting detail**

- Documents to support the implementation and ongoing use of electronic prescribing and administration are developed and available before implementation.

- Documentation is targeted to the clinical end user and eHealth interface.

- Documentation includes a change control process for each change to the system. Change control is authorised by the pharmacy project lead.

- How much reliance to place on electronic access is considered especially in relation to business continuity where the wider network may be affected.

- Experience suggests that clinical staff may find abbreviated laminated ‘how to...’ quick-reference guides valuable. Examples of documentation include:
  - how to manage planned downtime (less or more than 30 minutes duration)
  - how to manage requests for access to the system
  - how to set up new users on system
  - how to remove users from system
  - training guides
  - changes to the standing drug dictionary, and
  - change control authorisation.
**Recommendation 1.10**

Documents are adapted to suit local needs.

**Supporting detail**

- Consider sharing documentation with other NHS boards that have already implemented an electronic prescribing and medicines administration system - “Steal shamelessly” (HEPMA, pharmacist).
- This may be a safe and effective approach as the documentation will already have been tested and developed. These can be used as a basis for local documentation and prevent “reinventing the wheel” (CEPAS, pharmacist).
- Some adaptation in approach may be needed between clinical areas to reflect necessary variation.
- The team is prepared to update documentation based on feedback from users.

**Recommendation 1.11**

Document management includes retention of the implementation plans and risk registers.

**Supporting detail**

- Project records are archived for future reference (for example project implementation plans and risk registers).
Recommendation 1.12

Document control is essential and a scheme of delegation for authorisation is outlined.

Supporting detail

- A scheme of delegation for the authorisation of standard operating procedures is agreed according to local NHS board arrangements for records management.
- Documentation and training materials are regularly updated and maintained.
- Documentation is routinely reviewed and updated as part of each major upgrade of the system if required.
- The relevant documents are accessible to users in each clinical area using the publication standards applicable in each NHS board.
- Records management systems (including version control, review dates and authorisation arrangements) are applied.
**Self-assessment checklist with action planning: Governance and risk management**

This checklist is best completed after you consider the supportive detail which underpins the recommendations.

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<tr>
<th>Criteria</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Action</th>
<th>Priority?</th>
<th>Who will action?</th>
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<th>Review date</th>
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<tr>
<td>Is support from the NHS board’s director of pharmacy (DoP) and area drug and therapeutics committee (ADTC) secured?</td>
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<td>Do the DoP and ADTC acknowledge their medicines governance roles in supporting the safe and successful implementation, maintenance and optimisation of electronic prescribing and medicines administration systems?</td>
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<td>Have the potential risks associated with operating a dual (paper and electronic) system been identified and mitigated?</td>
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<td>Have the new types of potential risks to patient safety when the electronic prescribing and medicines administration system is introduced been identified and mitigated?</td>
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<td>Has the ADTC validated clinical decision support functionality decisions?</td>
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<td>Has the ADTC sanctioned prescribing protocols?</td>
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<td>Is good document management in place?</td>
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<td>Are supportive documents up to date and accessible for all users?</td>
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Leadership and organisational change

Summary of recommendations

Ownership and leadership

2.1 The electronic prescribing and medicines administration system underpins how medicines governance is delivered within an organisation.

2.2 Implementation is a multi-professional project requiring organisation-wide support.

2.3 There is strong ownership and leadership from local nursing, medical and pharmacy senior management teams.

Organisational effort and resource capacity

2.4 Organisational support for the project is secured from the outset.

2.5 There is a formal project plan and a dedicated and resourced team is identified to ensure a safe and successful implementation of the electronic prescribing and medicines administration system.

2.6 It is acknowledged that more resource (people, time and hardware) will be required than initially anticipated.

Project board

2.7 The project board has responsibility for overall project governance and ownership and leadership.

2.8 Membership comprises wide senior stakeholder representation.

2.9 The project board meets at a frequency commensurate with the stage of the project.

2.10 There is a pragmatic approach to arranging meetings.

Project implementation team

2.11 The project implementation team co-ordinates the change and reports to the project board.

2.12 The project implementation team is a hands-on multidisciplinary team comprising a project manager and representatives from key disciplines and users.

2.13 The project implementation team meets regularly before, during and after implementation.

Pharmacy project lead

2.14 There is a designated pharmacy project lead throughout implementation and on an ongoing basis to provide clinical leadership.

2.15 The pharmacy project lead drives the project in all professional spheres.
Managing change

2.16 The behavioural change required is acknowledged and reasons for resistance are understood.

2.17 Confidence is increased and anxiety relieved through education and support.

2.18 Without over-selling the system, it is ensured that the potential benefits for individual users are recognised.

2.19 Every attempt is made by the implementation team to understand the differences the system will bring and how this impacts on work practices.

Implementation process

2.20 Successful implementation relies on adequate preparation and planning, support and communication.

2.21 The initial aim is for basic, but safe functionality with flexibility to develop the system in the future.

2.22 Before implementation, process mapping is undertaken to understand the impact the electronic prescribing and medicines administration system will have on workflow.

2.23 Initial sites are selected with care and lessons learned from previous implementations are incorporated into subsequent implementations.

2.24 A go live date is selected with care.

‘Business as usual’ process

2.25 After a period of transition, the project board focuses on benefits realisation.

2.26 The area drug and therapeutics committee provides business as usual support, making decisions on post-implementation maintenance and development of the electronic prescribing and medicines administration system.

2.27 Business as usual arrangements require provision of ongoing resource to maintain, test and develop the system and drive clinical benefits.

Communication

2.28 The project is supported with strong communication based on a communication plan.

2.29 All staff are well informed using appropriate channels before, during and after implementation.

Engagement and involvement

2.30 There is engagement and involvement of all wards, departments and clinical groups and committees.

2.31 The timing of engagement is critical and starts when the project is approved.

2.32 A feedback process is set up for users to present suggestions for potential development.
User support: pre-implementation support

2.33 Visiting another ward, site, hospital or NHS board to see a system in use in clinical practice is recommended.

2.34 It is stressed that each implementation is unique and varies between wards, between hospitals and from NHS board to NHS board.

User support: implementation and ongoing support

2.35 User support is key to a safe and successful implementation.

2.36 Continuous support is available both in and out of hours 24/7/365, with queries dealt with appropriately to avoid potential risk to patient safety through delay.

2.37 Technical queries are dissociated from clinical ones.

Training: organisational commitment

2.38 Organisational commitment is secured at the outset.

2.39 A training plan is developed.

2.40 The training plan identifies and mitigates the potential risks associated with training.

2.41 Frequently shifting go live dates, often at short notice, are anticipated.

2.42 The organisational and administrative commitment to plan for and resource training for the large numbers of student nurses is acknowledged.

Pre-implementation training: who requires training?

2.43 Training is mandatory for all grades of healthcare professionals required to use the system.

2.44 Generic log-ins are not acceptable for electronic prescribing and account usernames and passwords are not to be issued until training has been undertaken.
Pre-implementation training: when should training be delivered?

2.45 It is recognised that training takes longer than anticipated.
2.46 Training is delivered as close to the go live date as possible.
2.47 The training sessions are organised for quieter days or quieter times of the day.
2.48 Mop-up training sessions post-implementation are arranged.

Pre-implementation training: how should training be delivered?

2.49 The training is related to the workplace using a practical, hands-on approach.
2.50 The minimum training requirement based on individual users and complexity of functionality within individual systems is determined.
2.51 Training is targeted to role and functionality.
2.52 Training is conducted in small groups.
2.53 Local training materials are developed.

Ongoing training

2.54 Existing staff are trained on new functionality.
2.55 New staff have immediate access to training.
2.56 Nurses are trained by nurse expert users.
2.57 Pharmacy teams and medical or non-medical prescribers are trained by the pharmacy project team.
Ownership and leadership

Recommendation 2.1

The electronic prescribing and medicines administration system underpins how medicines governance is delivered within an organisation.

Supporting detail

- The director of pharmacy and the area drug and therapeutics committee are crucial in supporting the implementation, maintenance and optimisation of electronic prescribing and medicines administration systems (refer to ‘medicines governance in local NHS boards’ in ‘governance and risk management’):
  - the director of pharmacy is responsible for medicines governance, and
  - the area drug and therapeutics committee is the key professional advisory group for medicines governance.
Recommendation 2.2

Implementation is a multi-professional project requiring organisation-wide support.

Supporting detail

- As an electronic prescribing and medicines administration system is "part of the patient’s journey, not standalone" (HEPMA, pharmacist), a collective approach to its implementation is required.

- There are mixed perceptions whether the implementation of an electronic prescribing and medicines administration system is a single profession, clinical, pharmacy or eHealth project. However, in reality it requires to be a multi-professional project with organisation-wide ownership.

- It is crucial to secure buy-in from all key disciplines (nursing, medical, eHealth and pharmacy) at an early stage:
  - early engagement of the NHS board’s officer responsible for medicines governance is essential.
  - there is frequently strong pharmacy involvement as the clinical champion is usually a pharmacist. The pharmacy project lead should drive the project in all professional spheres, including nursing and medical. Being a strong advocate, the pharmacy project lead will be one of the key factors in the success of the project (refer to ‘pharmacy project lead’ below).
  - securing eHealth engagement as a full partner is vital. It is recognised, that an electronic prescribing and medicines administration system is only one application, albeit a significant one, from the many being managed by local eHealth teams. Consequently, early engagement with the eHealth team and identifying a designated lead - "an eHealth navigator" (CEPAS, nurse) - is crucial. The roles and responsibilities of the clinical and eHealth teams are clearly defined and formalised at the outset of the project and modified as required. A memorandum of understanding or service level agreement has been found to be helpful.
  - an escalation structure is agreed should implementation not go to plan.
Recommendation 2.3

There is strong ownership and leadership from local nursing, medical and pharmacy senior management teams.

Supporting detail

• The successful implementation and maintenance of an electronic prescribing and medicines administration system requires strong ownership and leadership from local senior management teams.

• Local ownership is needed to provide solutions to local problems. It is agreed in advance who will own arising problems and who can help resolve any issues.

Organisational effort and resource capacity

Recommendation 2.4

Organisational support for the project is secured from the outset.

Supporting detail

• The magnitude of the task ahead is not underestimated. Implementation of the electronic prescribing and medicines administration system is a high priority associated with significant risk if not implemented safely. It is, therefore, crucial to ensure organisational commitment at the outset which needs to be more than simply “lip service to support” (HEPMA, nurse). There may be an expectation to “get on with the new system” (CEPAS, doctor), but staff should not feel it is solely down to them to implement the system.

• The approach to implementation that is most appropriate for the organisation is considered (for example big bang, incremental, accelerated). Remember that there may be frustrations within sites or units which do not yet have the electronic prescribing and medicines administration system and careful explanation of the reasons (for example financial, infrastructure, other) may be required. Where possible, identify in advance potential challenges which may generate delays with roll-out. There may be “a few false dawns” (CEPAS, doctor) over a very short period which can generate apprehension so try to keep positive as a strong exponent of the system.
Recommendation 2.5

There is a formal project plan and a dedicated and resourced team is identified to ensure a safe and successful implementation of the electronic prescribing and medicines administration system.

Supporting detail

- As with all eHealth projects, a formal project management approach in accordance with the NHS board’s systems of eHealth governance is essential.

- A dedicated clinical and eHealth team is required for the safe and successful implementation of an electronic prescribing and medicines administration system.

- The project implementation team is supported by the appointment of a designated project manager to co-ordinate and administer the project plan:
  - as far as possible, key staff are freed up from their day to day duties to support the project at various points.
  - implementation of the electronic prescribing and medicines administration system can generate a large workload for specific key individuals, but initially this is “an unknown quantity” (CEPAS, pharmacist) which will create new ways of working.
  - incorporating the additional work which implementation involves within the routine working week is unsustainable and re-allocation of work to other members of staff may, therefore, be necessary.
  - the additional funding requirements associated with the extra staff (for example bank nursing staff) needed to support go live is identified.
  - the resources required to support ongoing roll-out are also considered.
  - a singular expert approach is avoided. This will avoid a single point of failure by “not putting all your eggs in the one basket” (HEPMA, pharmacist). Sharing knowledge beyond one key individual builds capacity within the team and also ensures there is sufficient back-fill for fluctuating workload, leave and other absences.
• At an early stage, a formal project plan for implementation of the electronic prescribing and medicines administration system is devised (for example regionally across the NHS board or locally at one site). This considers:
  o capacity planning and resource requirements to ensure safe, incremental implementation
  o the skills required to manage the project and who within the organisation has these skills
  o the duration these individuals would be required to work on the project – temporary or permanent
  o initial and ongoing implementation costs
  o technology and infrastructure, including maintenance
  o training requirements – initially and ongoing
  o 24/7 support – initially, ongoing and out of hours, and
  o governance requirements.

• Roles and responsibilities for the full project duration are outlined and agreed (possibly years). Clarifying who is responsible for which areas of the project avoids future misunderstandings and miscommunication.

Recommendation 2.6

It is acknowledged that more resource (people, time and hardware) will be required than initially anticipated.

Supporting detail

• Sufficient time and resource to implement and maintain the electronic prescribing and medicines administration system is allowed.

• Experience suggests that more resource (people, time commitment and hardware) will be required than initially anticipated – “Massively more work to set up than had been anticipated” (CEPAS, doctor).

• The ongoing resource requirements are not overlooked – “These are not wash and go systems” (HEPMA, pharmacist).
Project board

Recommendation 2.7
The project board has responsibility for overall project governance and ownership and leadership.

Supporting detail

- The only way to deliver the project is through clinical engagement. Leadership must, therefore, be provided by clinicians (including medical, nursing and pharmacy) and eHealth.

- A strongly governed and well executed project requires:
  - a project manager responsible for planning the project
  - formal meetings of both the project board and the implementation team with good attendance
  - all governance decisions documented and archived making them potentially auditable, and
  - roles and responsibilities clarified at the outset.

- The final ‘go’ or ‘no go’ decision lies with the chair of the project board advised by the project implementation team and the clinicians in the specific area going live:
  - they jointly assess the relative risks of the project going or not going ahead.
  - the final project sign-off requires confirmation that there is an optimum state of readiness for a safe implementation, including documentation, all healthcare professionals required to use the system are trained, infrastructure is in place (for example networks, access to devices and printers) and system resilience.
Recommendation 2.8
Membership comprises wide senior stakeholder representation.

Supporting detail

- Project board membership includes wide senior stakeholder representation with decision-making capability from across the NHS board, an understanding of what is required and an ability to "tap into resources at mothership" (CEPAS, doctor). This will ensure the correct roles are in attendance at project board meetings to lead and advise on project governance.

- Membership of the project board includes consideration of the following roles:
  - director of pharmacy
  - medical director or nominee
  - nursing director or nominee
  - clinical eHealth lead
  - chair of the area drug and therapeutics committee
  - eHealth director
  - project manager, and
  - pharmacy project lead.

- Other roles to consider include leads from:
  - senior management
  - finance
  - operations and planning
  - information governance
  - internal audit, and
  - clerical.

- The chair and vice-chair of the project board are ideally the director of pharmacy and another lead clinician.
Recommendation 2.9

The project board meets at a frequency commensurate with the stage of the project.

Supporting detail

- The project board meets on a regular basis to monitor delivery of the project, consider the risks and agree a timeline for delivery.
- After go live, the effectiveness of the implementation is evaluated to ensure electronic prescribing and medicines administration fits with the organisation’s strategic priorities.
- A lessons learned report is completed and discussed.
- The project board considers the benefits realisation over the ensuing few years.

Recommendation 2.10

There is a pragmatic approach to arranging meetings.

Supporting detail

- Options for meeting:
  - locations are carefully considered to facilitate the release of staff to attend meetings. Some staff may also have clinical commitments and will prefer to minimise time spent travelling to attend meetings.
  - meetings are arranged to avoid clinical time.
  - if face to face meetings are impractical, consider tele-conferencing or video-conferencing.
- Agenda for project board meetings:
  - the business on the agenda is separated into items relating to the clinical and technology or systems elements to allow clinician project board members to attend only the parts of meeting relevant to them.
Project implementation team

**Recommendation 2.11**

The project implementation team co-ordinates the change and reports to the project board.

Supporting detail

- The project implementation team facilitates and co-ordinates the change management required.
- The project implementation team engages and liaises with medical, nursing, pharmacy and eHealth teams across the NHS board.
- The team reports to the project board on pertinent issues and provides re-assurance that all systems are in place before final sign-off.
- The resource required is not under-estimated as the project implementation team will plan, manage, work towards and implement the system – they are the “driving force for the project” (HEPMA, eHealth).

**Recommendation 2.12**

The project implementation team is a hands-on multidisciplinary team comprising a project manager and representatives from key disciplines and users.

Supporting detail

- Members of the project implementation team are the champions of the project.
- A multidisciplinary approach is required with users from all the key disciplines represented, including nursing, medical, pharmacy and eHealth.
- Dedicated nursing, medical, pharmacy and eHealth leads are secured early in the project planning phase.
- Initially securing champions from disciplines other than pharmacy may be challenging, particularly if the electronic prescribing and medicines administration system is viewed as being driven by pharmacy.
The individuals on the project implementation team have a hands-on role which is essential to success of the implementation:

- the project implementation team membership adapts depending on the clinical area into which the electronic prescribing and medicines administration system is being implemented.
- a good core team capable of working at NHS board level to break down barriers, raise awareness, communicate and support users in their own areas is required - “warming up staff from all sides” (HEPMA, pharmacist).
- those on the project implementation team are likely to know their colleagues on wards personally which is a definite strength.
- the team works at the “broken end of the bottle” (CEPAS, doctor) and the support the team members offer their peers on-site from an early stage is crucial to the success of the implementation - nurses relay to nurses, pharmacists to pharmacy, and consultants to their teams. The benefits of this approach are two fold: (i) the impact the electronic prescribing and medicines administration system will have for key users is appreciated, and (ii) it ensures nothing appears unexpectedly for clinical teams.

The project manager, who has overall responsibility for organisation and project planning, has strong interpersonal and communication skills and is organised with attention to detail:

- to be effective the project manager is ambitious for the project, provides clarity on roles, responsibilities and expectations, and plans ahead for implementation and beyond.
- the project manager does not require to be aligned to any discipline (for example eHealth) as there will be others on the core team aligned to disciplines to deal with any arising issues.

Implementing an electronic prescribing and medicines administration system can generate a large additional workload for the individuals on the project implementation team:

- the team requires protected time to allow them to be freed up from their routine duties to support the project.
### Recommendation 2.13

The project implementation team meets regularly before, during and after implementation.

#### Supporting detail

- Meeting frequency is determined by the stage of the implementation and identified need:
  - strong lines of communication with the clinical end users are important.
  - before go live:
    - the team meets regularly to discuss potential issues with logistics, planning, risk management, and governance.
    - more regular (and possibly ad hoc) meetings may be required closer to implementation.
    - weekly meetings are considered when ‘go/no go’ decisions are required and things “start to get fraught with tears and snotters” (HEPMA, pharmacist)
      - this allows for discussion of the previous week’s events and planning for the following week
  - at go live:
    - key stakeholders evaluate the success (or otherwise) on a daily basis over the first few days of implementation with feedback provided to the project board as required. Key representatives from the project board may wish to be involved in these discussions.
  - after go live:
    - several weeks post-implementation, a formal evaluation of the implementation is conducted with clinicians and any concerns addressed.
    - the lessons learned from each stage of the project inform improvements as the project progresses.
  - ongoing:
    - there is continued engagement with the user base regarding ease of use and system developments.
Pharmacy project lead

Recommendation 2.14

There is a designated pharmacy project lead throughout implementation and on an ongoing basis to provide clinical leadership.

Supporting detail

- Experience to date in NHSScotland indicates that a designated pharmacy project lead is required throughout implementation and ongoing:
  - during implementation, this dedicated role facilitates implementation on-site and/or across the NHS board area.
  - when roll-out nears completion, the pharmacy project lead addresses business, strategy and management issues.
- This key individual is capable of working at a senior level:
  - preferably the individual should be a practising clinician with knowledge and understanding of the processes and systems involved in prescribing, administration and supply of medicines, medicines legislation, governance, and eHealth.
  - the person is able to communicate effectively, provide leadership across a multidisciplinary team, remain calm and react rationally.

Recommendation 2.15

The pharmacy project lead drives the project in all professional spheres.

Supporting detail

- The pharmacy project lead drives the project in all professional spheres, including nursing and medical.
- Being a strong advocate, the effectiveness of the pharmacy project lead will be one of the key factors in the success of the project.
- The lead also acts as a single point of contact, supporting users and working with the project manager to liaise between wards and eHealth and vice versa.
Managing change

**Recommendation 2.16**

The behavioural change required is acknowledged and reasons for resistance are understood.

- Recognise that the biggest challenge for implementation is not the system or application, but managing people and helping them to adapt to new ways of working.

- Accept that staff will take time to get used to it and “expect teething problems” (CEPAS, doctor).

- Appreciate there will be “pain, before the gain” (HEPMA, pharmacist).

- Resistance will most likely be due to the perception of change and unfamiliarity and uncertainty associated with using technology:
  - Staff may remonstrate that an electronic prescribing system will not work, it will slow down their busy ward or the ward is not ready for it.
  - Staff may also be concerned how to respond in the unlikely event of the system failing.

- The concept of electronic prescribing and medicines administration is not introduced too early as it may lead to cynicism – “Tomorrow may never come so need to make certain it is definitely coming” (HEPMA, eHealth).

- Staff do not appreciate the change until go live becomes a real date – “People don’t engage with it until reality” (HEPMA, nurse).
Recommendation 2.17

Confidence is increased and anxiety relieved through education and support.

Supporting detail

- Perceptions can be overcome by education and support which will relieve anxieties and increase confidence:
  - this is crucial as staff are being asked to change how they have worked over years.
  - the implementation team ensures staff are “willing and able to procedurally ditch paper systems” (CEPAS, pharmacist).

- An overall positive perception of the system is maintained by listening then responding to any negative feedback in a positive and constructive manner. This ensures that those leading the project maintain a positive outlook as negativity is infectious and “spreads like a virus” (CEPAS, pharmacist).
Recommendation 2.18

Without over-selling the system, it is ensured that the potential benefits for individual users are recognised.

Supporting detail

- The system is not over sold at the beginning and staff are not told that the system will do something if it does not:
  - expectations are managed and, where possible, the benefits delivered early to avoid disappointment.
  - it may also be beneficial to evaluate the implementation and report back to users on progress.
- It may take longer to log in and prescribe for a patient and the individual benefits may not be immediately apparent.
- Clear success messages are sent:
  - success demonstrated in an initial implementation site can be used as an example for future roll-out to other areas of the hospital, to other hospitals across the NHS board or to other NHS boards.
- The benefits of the system for individual users are recognised:
  - it is remembered, however, that there will be some benefits awareness at outset, but the benefits the electronic prescribing and medicines administration system will bring to an individual organisation are as yet largely unknown.
- If medical, nursing and pharmacy teams are able to see the personal benefits of the system, there is less resistance as they can understand the value of the system - “The more problems that people perceived with the old system, the happier they were implementing the new system” (CEPAS, pharmacist).
- The benefits from other wards, sites and hospitals within the organisation that are already using the system are described:
  - if this is the first implementation within the organisation then describe the benefits other NHS boards have experienced on implementing an electronic prescribing and medicines administration system.
  - it may also be useful to arrange visits to another site, hospital or NHS board as this may ameliorate some concerns.
Recommendation 2.19

Every attempt is made by the implementation team to understand the differences the system will bring and how this impacts on work practices.

Supporting detail

- Consider how the electronic prescribing and medicines administration system will change work practices - “The job is no more difficult, if not easier” (HEPMA, doctor).

- Consider using the electronic prescribing and medicines administration system to re-design services as “HEPMA is a key ingredient making the process more patient-centred” (HEPMA, doctor).
Implementation process

Recommendation 2.20
Successful implementation relies on adequate preparation and planning, support and communication.

Supporting detail
• The key to successful implementation is adequate preparation and planning, support, communication and a strongly governed project with a formalised project management plan - “Not as bad as I thought it was going to be” (HEPMA, nurse).
• The preparation time and support required is not underestimated.
• During implementation, keep users informed of developments (refer to ‘communication’ in ‘leadership and organisational change’).
• Attendance and participation by members of the senior management team during the implementation period emphasises the importance assigned to the project and recognises the challenges that staff on the ground are working to overcome (similar to ‘leadership walkrounds’ as used in the Scottish Patient Safety Programme: www.scottishpatientsafetyprogramme.scot.nhs.uk/programme/resources/leadership-walkrounds).

Recommendation 2.21
The initial aim is for basic, but safe functionality with flexibility to develop the system in the future.

Supporting detail
• The different models for roll-out (for example big bang, incremental, accelerated) are understood as are how the risks for medical, nursing and pharmacy teams are managed.
• The overall ethos is to start with a system that is basic, but safe.
• Implementation is not at too high a level at the start.
• The basics, correctly implemented, are addressed first and thereafter the system is developed simply with flexibility to gradually build in functionality.
Recommendation 2.22

Before implementation, process mapping is undertaken to understand the impact the electronic prescribing and medicines administration system will have on workflow.

Supporting detail

- Routine work practices before implementation and the impact of the new system after implementation are considered - “Walk the walk before implementing to identify what will work best at the coalface” (CEPAS, pharmacist).

- It is recognised that while work practices will change, it may be difficult to determine in advance how the system will impact.

- To understand the impact on workflow, process mapping is undertaken before implementation.

- All ward staff are involved in thinking the process through from start to finish and testing the system around patient and workflow - “Look at patient pathways and processes as sometimes we’ve done it for so long that we have just accepted what was happening” (CEPAS, pharmacist).
**Recommendation 2.23**

Initial sites are selected with care and lessons learned from previous implementations are incorporated into subsequent implementations.

**Supporting detail**

- To test the functionality (including clinical decision support), a self-contained unit with few patient transfers, but a high level of prescribing, is a suitable area in which to start.

- Staff who are keen to be involved are identified; supportive and enthusiastic clinicians (both nursing and medical staff) can generate interest and drive project - find the “catalysts” and “push at an open door” (HEPMA, eHealth).

- A staged implementation, where the electronic prescribing and medicines administration system is introduced, followed by a period of reflection on the effectiveness of the implementation methodology, before further roll-out over realistic timescales using an agreed implementation plan is considered. Learning is continuous over the whole roll-out, with lessons learned from the initial implementation incorporated into the project plan for subsequent implementation and roll-out.

- It is acknowledged that the learning from others is not restricted solely to the local ward, site or hospital, but equally can apply to learning from the experiences of other NHS boards that have implemented an electronic prescribing and medicines administration system. This avoids making the same mistakes. However, this has to be balanced with the acknowledgement that what works in one specialty may not work in another, even within the same site. Equally what works in one hospital may not work for another hospital, even within the same NHS board.

- When rolling out in phases, the hospital will be operating with two different systems and this generates risks for patients who are transferred. It is ensured that staff do not assume that patients have only been prescribed drugs on either the electronic or paper system. There is a tendency to forget about drugs if they are not prescribed on the system the ward to which the patient is being transferred is using. There is a risk that drugs may, therefore, not be administered on time or missed altogether.

- A time limit by which all patients transferred at the weekends on paper drug charts will be transcribed is agreed (for example transfer from paper to electronic will be complete within 24 hours).

- It is acknowledged that during roll-out, the pharmacy dispensary team deals with discharge prescriptions from the two different systems in operation.
Recommendation 2.24
A go live date is selected with care.

Supporting detail

- A go live date is selected carefully to avoid Christmas, Easter and summer holidays, winter bed pressures and new doctor changeovers.

- Delays are anticipated due to unexpected occurrences (for example interfacing issues):
  - the cause of an unexpected delay in implementation may take only a few weeks to rectify, but the consequence for the go live date can be a delay of a few months (see NHS Lanarkshire case study).

- All annual leave is cancelled for the week of go live as additional staff will be required to support drug administration and ward rounds to ensure clinical cover and sustainability. However, cancelling leave can generate a problem if the go live date is delayed.

- A day for implementation and designated timelines for delivery are set.

- Patients’ medication is transferred from the paper to electronic prescribing and medicines administration system in preparation for go live:
  - going live before the Tuesday midday drug administration round allows patients’ medication to be transcribed on the Monday and/or Tuesday morning immediately before go live.
  - transfer is best undertaken by teams of two pharmacists, usually a pharmacist experienced in the use of electronic prescribing and another pharmacist:
    - if one pharmacist transcribes and the other checks, this provides a cross-check of all entries to the system, and
    - if possible, consider enlisting junior doctors to help as this will also provide them with experience of using the electronic prescribing and medicines administration system.
  - transcription and checking takes approximately 3-4 hours for a 20 bedded unit using a single two man team, but is likely to take longer than anticipated:
    - using multiple teams is advisable to minimise the transition time.
  - communication during the period of transition is necessary to ensure any changes to medication are accurately reflected on the electronic prescribing and medicines administration system before cut-over from paper to electronic.
‘Business as usual’ process

**Recommendation 2.25**

After a period of transition, the project board focuses on benefits realisation.

**Supporting detail**

- A period of transition is required to move from an implementation and delivery focus to a maintenance and development focus.
- The project board should focus on benefits realisation (refer to ‘benefits realisation’).

**Recommendation 2.26**

The area drug and therapeutics committee provides business as usual support, making decisions on post-implementation maintenance and development of the electronic prescribing and medicines administration system.

**Supporting detail**

- Business as usual governance support is provided on an organisational basis by the area drug and therapeutics committee (ADTC).
- The ADTC oversees the ongoing governance and development of the electronic prescribing and medicines administration system.
Recommendation 2.27

Business as usual arrangements require provision of ongoing resource to maintain, test and develop the system and drive clinical benefits.

Supporting detail

- Electronic prescribing and administration systems are complex clinical systems, still in the early stages of technical development.
- Dedicated ongoing resource is required to maintain and develop the system, test new versions and maintain the programme of training.
- Ongoing resource includes clinical leadership and eHealth support.
- Post-implementation activities requiring to be developed include:
  - Embedding support arrangements and requirements for service level agreements
  - Testing and endorsement of functionality changes associated with upgrades
  - Developing work plans
  - Feedback to the software supplier on suggestions for change to enhance the system in response to clinical concerns, and
  - Ongoing training.
Communication

**Recommendation 2.28**

The project is supported with strong communication based on a communication plan.

**Supporting detail**

- Effective communication, based on a communication plan, is critical to the success of the project.

- Strong communication is required with all groups to raise awareness, encourage user acceptance and facilitate implementation.

- Assumptions that people have knowledge of what is going to happen are not made. Experience suggests that there can never be enough communication and the same message may need to be repeated many times.

- The project board and project implementation team are key contacts:
  - the project implementation team forms a communication and escalation channel to main users affected by the project (particularly medical, nursing and pharmacy teams).
  - using the project implementation team to communicate to each discipline affected by the project should ideally secure ownership and buy-in. However, as experience indicates, this has variable effect, and other suitable channels for communication should be pursued.
Recommendation 2.29

All staff are well informed using appropriate channels before, during and after implementation.

Supporting detail

- Communication before implementation:
  - initial communication is best delivered verbally through attendance at staff meetings of various users (including nurses, medics) and senior management meetings. In presentations it may be helpful to include screen shots or even organise a demonstration of the system. Clinical teams will be keen to hear of the benefits the electronic prescribing and medicines administration system will bring to users.
  - “close to the ground” communication (HEPMA, eHealth) between the clinical pharmacy and ward teams may be effective with reinforcement by the organisation’s senior leadership team.
  - at an early stage “repeated cajoling” (CEPAS, pharmacist) may be required to secure focus on the electronic prescribing and medicines administration system.
  - interpersonal communication is likely to have a positive impact in a small unit, but may become unmanageable across different areas or hospital-wide.
  - consider sharing information on the imminent changes with staff on the ward who are not affected by the change (for example nursing assistants) to raise awareness of the electronic prescribing and administration system and avoid nurses getting interrupted during drug administration rounds, especially in the early stages of introduction.

- Communication at go live:
  - one week before go live consider distributing a reminder of the go live date, contact details for project implementation team and any user guides or relevant links to the intranet (see below).
  - potential future users in wards which do not yet have the electronic prescribing and administration system may experience anxiety when they hear issues being discussed - “Word of mouth at the smoking shelters” (HEPMA, nurse):
    - this applies not only to clinical but also managerial roles, and
    - fears require to be allayed as staff may “see these as show stopping issues” (CEPAS, pharmacist).
  - as the hospital may be operating two systems (paper-based and electronic) consider information flow when patients transfer between wards with and without the electronic prescribing and medicines administration system.
• Ongoing communication after implementation:
  - consider a monthly communication newsletter or bulletin to the NHS board for ongoing communication after implementation.
  - securing a designated section on the NHS board’s intranet site to provide access for clinical staff to electronic prescribing and medicines administration information may prove popular (for example key contact details, standard operating procedures, policies, memos, frequently asked questions, user guides, and system notices).
  - a generic electronic prescribing and medicines administration email address is set up and regularly checked for mail.
  - project communications are depersonalised as far as possible - send communication from a generic email rather than an individual person with project responsibilities.
  - information on planned downtime and upgrades is communicated in advance:
    - meetings with ward staff are arranged to allow them to choose a convenient time to fit the upgrade with ward routines (for example between drug rounds)
    - it may also be valuable to prepare posters to display in clinical areas informing staff of upgrades, and
    - consider if the eHealth team could distribute a standard system notice in advance of any periods of downtime. This is a structured email providing contact details and detailing:
      - why there will be downtime
      - what systems and services will be affected
      - who will be affected
      - when and how long the downtime is planned for.
  - communicating unplanned downtime:
    - this is best undertaken using a cascade approach within teams via the ward clinical pharmacists and technicians, and
    - each ward and medical team is contacted with an update on what is happening.

• Email as an option for communication is explored, but not used in isolation as while all staff will have the opportunity to read the email, many will not - experience suggests that nursing and medical staff may not read or respond to emails.
Engagement and involvement

Recommendation 2.30
There is engagement and involvement of all wards and departments and clinical groups and committees.

Supporting detail
- There is engagement and involvement of all wards, departments including eHealth, medical records, estates and other healthcare professionals.
- There is also engagement with professional and clinical groups and committees with responsibility for clinical management, eHealth, clinical delivery, clinical governance and risk management in the NHS board.
- The area drug and therapeutics committee includes the implementation of an electronic prescribing and administration system as a standing item on the agenda.
- With additional training, interested nurses and doctors may be willing to become super-users to support staff working in their clinical areas.
- It may also be valuable to engage with other NHS boards with experience of electronic prescribing and administration systems.

Recommendation 2.31
The timing of engagement is critical and starts when the project is approved.

Supporting detail
- The timing of engagement is critical and starts when funding has been secured and the organisation is committed to the project.
- While for some, staff training may be the first point of engagement, ideally staff are involved early in the planning process to gain support and facilitate change for all those impacted by the new system.
- Sharing information in this way helps to re-assure, engage and motivate staff.
Recommendation 2.32

A feedback process is set up for users to present suggestions for potential development.

Supporting detail

- A process for nursing, medical and pharmacy system users to provide feedback on concerns or user acceptance of the electronic prescribing and medicines administration system is set up.

- This can be accomplished through the existing project support structure and/or online tools.

- Users, therefore, have a means to present issues for follow-up and development by the project implementation team and software supplier.

- Expectations are managed as developments can take time and lead to user frustration.
User support: pre-implementation support

Recommendation 2.33

Visiting another ward, site, hospital or NHS board to see a system in use in clinical practice is recommended.

Supporting detail

- It may be beneficial for individuals who are key to the implementation of the system to visit another ward, site, hospital or NHS board who have already implemented an electronic prescribing and medicines administration system to see it being used in clinical practice.

- There is now an increasing number of NHS boards in Scotland with expertise who are able to accommodate other NHS boards working towards electronic prescribing and medicines administration. This spreads the site visit load.

- Experienced sites also offer helpful advice, support and reassurance to others who are soon to go live:
  - this provides a forum to share concerns and ask questions in a non-judgemental way.
  - listening to, and learning from sites who have implemented this technology saves time and prevents the same mistakes being repeated — “...we learned as we went along...failures were repeated due to information not being shared...there was an opportunity to take this up and save hours...” (CEPAS, pharmacist).
Recommendation 2.34

It is stressed that each implementation is unique and varies between wards, between hospitals and from NHS board to NHS board.

Supporting detail

- Each implementation is unique:
  - Even within the same hospital there will be variation between specialties - this is appropriate and must be accommodated.
  - For example, workflow in a care of the elderly unit will be different to that of an acute medical admissions unit.
  - Processes which have been successful in other implementations can be used as a basis and adapted locally.
- Each site must implement in their own way, understand the consequences of their decisions and be able to justify those decisions - “Stand and fall by own decisions” (HEPMA, pharmacist).
- Unnecessary variation is challenged and the opportunity to implement best practice taken, including implementing standardised organisational protocols rather than unique and individualised protocols (for example ‘Dr Brown’s Protocol’).
User support: implementation and ongoing support

Recommendation 2.35
User support is key to a safe and successful implementation.

Supporting detail

- Acknowledge the significant resource that is required to support implementation while recognising that support to users is a key ingredient for a safe, successful and smooth implementation. This encompasses support for both drug administration and prescribing ward rounds.

- Experience dictates that implementation should be “flooded with HEPMA facilitators” (HEPMA, eHealth).

- Expect drug administration and ward rounds to be slow at the start and anticipate some technical difficulties and disruption to daily activities during the initial implementation phase.

- Take steps to manage annual leave during go live as additional staff will be required to support drug administration and ward rounds to provide clinical cover and sustainability.

- Support is also required for other teams operating downstream from ward areas (for example pharmacy dispensary teams who are also new to the electronic prescribing and medicines administration system).
Recommendation 2.36

Continuous support is available both in and out of hours 24/7/365 with queries dealt with appropriately to avoid potential risk to patient safety through delay.

Supporting detail

- Support is provided by the following:
  
  - the project implementation team:
    - the team is available on-site for the bedding-in process. They will become “floor walkers” (CEPAS, pharmacist) and “invade the ward for a few days” (HEPMA, doctor).
    - the project implementation team and the ward’s clinical pharmacist are initially present to support each drug administration round (four times daily) and ward round in all wards going live.
    - this one to one support provides users with reassurance and will be withdrawn gradually as they gain confidence.
    - the duration of support required varies from person to person. Experience suggests support is usually required for the first few days, but may take up to a week, possibly longer. If offered between Tuesday and Thursday this would allow ward to be as self-sufficient as possible by the first weekend. The team is accessible via page thereafter.
    - issuing passwords (and password resets) is a huge task and time is allocated for this.
  
  - eHealth:
    - there is adequate eHealth resources with the required level of skills and knowledge to support the electronic prescribing and medicines administration system. Training on the new system may be required for eHealth teams.
    - having eHealth staff available or on stand-by on the wards for the first week of implementation is useful to deal quickly with any unanticipated technological issues which may arise.
    - a named/dedicated member of the eHealth team acting as a single point of contact can ensure continuity and consistency, particularly for what could be complex technical issues. However, the risk of embedding all knowledge and skills with a single individual is unacceptable. A team approach where there is shared knowledge and capacity to deal with fluctuating workload, annual leave and sickness is required.
o software supplier:

- good links are established with supplier and ensure they have “an understanding of the clinical realities” (HEPMA, pharmacist).
- the supplier has a wealth of experience and will be able to support with application issues.
- it is arranged with the supplier to be present for first few days of go live. This is strongly recommended for the first phase of implementation.
- a formalised 24/7/365 support contract is established with the supplier which is documented and agreed by the project implementation team and signed-off by the eHealth lead officer.
- designated points of contacts for communication and answering queries are provided. The pharmacy project lead will “act as a buffer” (HEPMA, pharmacist) for calls to the supplier for support.

o clinical pharmacists:

- the clinical pharmacy team provides ongoing support and training for prescribers and nurses.

o peer support:

- setting up a ‘buddy’ system may offer an additional layer of support.
- consider pairing wards who have experience using the electronic prescribing and medicines administration system with wards going live with the system.
- once the electronic prescribing and medicines administration system is established, wards should be able to support each other if an issue arises.
- new nursing staff will need to be supported at their first few drug administration rounds until they feel comfortable in the role. Nurses on the ward are best placed to support their new nursing colleagues.

• Clinical, technical and supplier support is provided 24/7/365, both in and out of hours:

o support during standard working hours:

- consider the sustainability and continuity of support for electronic prescribing and medicines administration systems.
- the risk of embedding all knowledge and skills with a single individual (for example the pharmacy project lead) is unacceptable. A team approach where there is shared knowledge and capacity to deal with fluctuating workload and annual leave is required.
out of hours support:

- a standard operating procedure is developed on both the support process for wards and call handling, prioritisation and communication by eHealth service desk or switch board when out of hours support is required.
- clinical and technical expert support needs to be available.
- those providing support must have remote access to the system at all times from all locations.
- on-call arrangements for out of hours are determined in advance and staff are aware who to contact should they need support.
- to avoid inappropriate calls, flowcharts are provided for switchboard to clearly indicate where calls should be referred.
- the teams dealing with calls (switchboard, pharmacy and eHealth) understand the level of priority to be given to calls relating to electronic prescribing and medicines administration and be capable of undertaking a rapid clinical risk assessment to guarantee patient safety. This requires application and clinical understanding as well as an awareness of contingency arrangements (refer to ‘contingency and disaster recovery - business contingency planning’ in ‘technology’).
- the on-call team is aware who the key support contacts are (including eHealth, pharmacy, supplier).

Call-out rates are monitored:

- this will provide an indication of the number of calls, reason for call, who is calling and when they are calling to determine who is needed and how many are needed to handle the calls whether clinical or technical related.
**Recommendation 2.37**

Technical queries are dissociated from clinical ones.

**Supporting detail**

- Clinical queries should still be dealt with by the clinical teams with support from the eHealth team for technical queries.

- It is, therefore, important that those handling the initial call are able to differentiate between clinical and technical queries to avoid inappropriate calls and potential risk to patient safety through unnecessary delays.

- A service level agreement between the clinical support (pharmacy) and eHealth to agrees responsibilities and an escalation route is implemented.

**Training: organisational commitment**

**Recommendation 2.38**

Organisational commitment is secured at the outset.

**Supporting detail**

- As training is a huge undertaking, organisational commitment is agreed in advance of initiating training:
  - although recognising that training must be delivered, it is feasible that "boards don’t really consider training" (HEPMA, pharmacist).
  - this includes recognition that training is mandatory for all grades of staff and awareness that usernames and passwords will not be issued until training has been completed.

- The essential commitment of the senior management team to ensure that staff will be released to attend training is secured.

- Training requirements often coincide with other events and enforcing attendance, especially from senior staff, may prove difficult particularly when there is likely be no additional funding to support training or provide extra staff to cover those released to attend training.
Recommendation 2.39

A training plan is developed.

Supporting detail

- A training plan for implementation of the electronic prescribing and medicines administration system is devised and agreed at the outset.

- The training plan identifies:
  - an approach to both pre-implementation and ongoing training
  - who needs training – users and wards are prioritised within the plan
  - when the training will be delivered – training is delivered within set timescales, ideally 2-4 weeks before go live
  - what training needs to be delivered
  - how the training will be delivered, and
  - governance arrangements including the potential risks associated with training and their mitigation, including shifting go live dates and resistance to training (see below and also refer to ‘governance and risk management’).

- The resource required to organise and deliver the training is not underestimated:
  - for training before, during and after implementation, and
  - to support staff turnover and new developments within the system.
Recommendation 2.40

The training plan identifies and mitigates the potential risks associated with training.

Supporting detail

- The project board may be reassured by a high percentage of staff trained. It may be valuable to identify a critical percentage as an indicator for sign-off that implementation can go ahead.

- The way in which an individual will be signed off as being competent at the end of training before an account username and password are issued is considered.

- Wards incorporate training into their nursing staff rotas. Trainers expect last minute cancellations, not through lack of commitment, but from unexpected issues which prevent nurses being released to attend training.

- Medical staff resistance or reluctance to attend training has been previously encountered. Non-attendees will experience difficulty when using the application to prescribe safely and effectively. Identifying an individual with responsibility for organising and co-ordinating medical staff rotas may encourage attendance at training.

- Training of medical staff is scheduled at convenient times which do not interfere with clinical commitments.

- An escalation route is agreed if resistance to or non-attendance at training occurs.

- The potential risks associated with using both bank and student nursing staff and medical locums is identified and mitigated.

- It is ensured that training reflects system developments, extension into additional specialties (for example ophthalmology, mental health, ICU, paediatrics) and ongoing changes in clinical practice.
Recommendation 2.41

Frequently shifting go live dates, often at short notice, are anticipated.

Supporting detail

- Implementation of the electronic prescribing and medicines administration system may be a long protracted process over a number of years with frequently shifting go live dates often at short notice. Consequently, electronic prescribing and medicines administration is “always coming and people don’t engage with it until the very end” (CEPAS, pharmacist).

- This can be challenging as training is best delivered immediately before go live.

- If there is a significant delay between training and implementation, staff may need re-trained as vital knowledge may have been lost.

- Numerous false starts may also result in some staff being trained several times.
**Recommendation 2.42**

The organisational and administrative commitment to plan for and resource training for the large numbers of student nurses is acknowledged

**Supporting detail**

- It is a huge organisational and administrative commitment for the large numbers of student nurses to be trained on electronic prescribing and medicines administration systems for drug administration rounds while on placements over their three years’ training:
  - the governance issues associated with allowing wide access are carefully considered.
  - the implications for the organisation in relation to vicarious liability are considered.
  - the possibility of limitations and/or implications associated with a large number of users in relation to the design of the system and licensing model are considered.
- Managing and resourcing the organisation and administration associated with maintaining this scale of user list and its security are considered.
- Currently, the majority of student nurses have no prior experience of electronic prescribing and medicines administration during their undergraduate course. Student nurses are taught using paper-based prescribing and administration systems, with some universities using simple screen shots to increase awareness of electronic prescribing and medicines administration systems. NHS board directors of nursing are engaged with nursing and midwifery undergraduate programme leads at the universities.
- There are three potential options for NHS boards to consider to address this:
  - drug administration rounds are for observation only for all nursing students, irrespective of year of study
  - supervised and witnessed drug administration access for all nursing students, irrespective of year of study, and
  - access to the system for only third year nursing students, with drug administration fully supervised and witnessed:
    - access is for the duration of their placement only with access rights removed on its completion, and
    - documentation for access is authorised by the senior charge nurse.
Pre-implementation training: who requires training?

Recommendation 2.43
Training is mandatory for all grades of healthcare professionals required to use the system.

Supporting detail

- Training aims to ensure that healthcare professionals using electronic prescribing and medicines administration systems are able to cope with routine situations which arise in their day to day practice. It is, therefore, mandatory for all grades of staff required to use the system.

- The following healthcare professionals require training:
  
  o nursing staff:
    - existing nurses, bank nurses, independent prescribers and student nurses are considered, and
    - those working solely night shifts are not overlooked.
  
  o medical staff:
    - junior doctors (two intakes of new starts each year and several rotations), new and existing senior doctors (including consultants) and locums are considered.
  
  o pharmacy staff:
    - pharmacists and pharmacy technicians in both clinical roles and pharmacy-based roles (including dispensary teams) are considered.
  
  o other healthcare professionals:
    - eHealth teams and other healthcare professionals (including microbiologists, physiotherapists and dieticians) may also require training. They may have prescribing rights or require read-only access to view medication records.
Recommendation 2.44

Generic log-ins are not acceptable for electronic prescribing and account usernames and passwords are not to be issued until training has been undertaken.

Supporting detail

- Electronic prescribing and medicine administration systems are unique, since an electronic signature is accepted against the prescription of a medicine:
  - Statutory Instrument 2008, number 1692 defines the requirements for prescriptions in electronic form. The Statutory Instrument defines an ‘advanced electronic signature’ as one which is ‘uniquely linked to the signatory, capable of identifying the signatory, created using means that the signatory can maintain under his sole control and which is linked to the data to which it relates in such a manner that any subsequent change in the data is detectable’.
  - the signatory is the health professional creating the prescription.
- Accordingly, generic log-ins are not acceptable for electronic prescribing and training of individual practitioners is essential.
- Account usernames and passwords are not issued until training has been undertaken.

Pre-implementation training: when should training be delivered?

Recommendation 2.45

It is recognised that training takes longer than anticipated.

Supporting detail

- Training generally takes longer than anticipated due to the large number of trainees, competing clinical priorities and access to suitable facilities.
Recommendation 2.46

Training is delivered as close to the go live date as possible.

Supporting detail

- To ensure the training is fresh for users, it is delivered as close to implementation as possible and ideally within 2-4 weeks of the go live date.
- It is acknowledged that organising training close to go live allows limited opportunity for staff to practise and familiarise themselves with the test system. However, experience indicates these opportunities are rarely used by staff.
- Anticipate possible criticism for organising training so close to implementation. The timing of the training is critical as it is “difficult to engage people when it [the go live date] is so distant” (HEPMA, pharmacist).

Recommendation 2.47

The training sessions are organised for quieter days or quieter times of the day.

Supporting detail

- This facilitates the release of ward-based staff to attend.

Recommendation 2.48

Mop-up training sessions post-implementation are arranged.

Supporting detail

- As pre-implementation training will never be complete, mop-up training sessions are arranged post-implementation.
Pre-implementation training: how should training be delivered?

**Recommendation 2.49**
The training is related to the workplace using a practical, hands-on approach.

**Supporting detail**

- Trainers recognise that although training must be delivered in advance of system implementation, optimal learning occurs in the live clinical situation.

- A combination of background theory and demonstrations delivered face-to-face in the classroom provides the best learning environment. This is followed by practical time spent at computers with test patients and scenarios for trainees to work through.

- A suitable environment is provided which relates training to the workplace and is easily accessible.

- It is recognised that while the traditional approach of delivering training in a classroom environment with computers and clinical scenarios is the easiest approach to deliver, it has limitations:
  - some staff may find it hard to relate the technology to their own day-to-day clinical practice.
  - ward-based staff usually prefer a more hands-on approach.
  - consequently, some staff may find it hard to absorb the information during the initial training.
  - at training the staff may be “scared out of their wits and feel uncomfortable” as they are overwhelmed and find it difficult to see how the system relates to their day-to-day work. However, “once they start to use it they realise it’s not such a big deal” so “hands-on is key” (HEPMA, pharmacist).

- The provision of ad hoc support from super-users during the go live period and in the days immediately following will consolidate learning from the formal training session (refer to ‘user support’ in ‘leadership and organisational change’):
  - the value of “see one, do one” in the live clinical environment cannot be underestimated (HEPMA, pharmacist).
Recommendation 2.50

The minimum training requirement based on individual users and complexity of functionality within individual systems is determined.

Supporting detail

- The minimum training is determined acknowledging that this will (i) vary for different types of user, and (ii) be dictated by the complexity of the functionality within individual systems.

- A minimum training requirement of one hour is a pragmatic compromise between the time taken to impart the required knowledge and the time during which wards can manage without staff.

- Although one hour is acceptable for non-prescribers, prescribers usually require two hours to deal with the full range of functionality.

- While overall awareness and familiarity of system functionality is advantageous, it is acknowledged that training on all aspects of the system can be overwhelming and confusing, as well as easily forgotten, by new system users.
Recommendation 2.51
Training is targeted to role and functionality.

Supporting detail

- As different users have different levels of access and use different functionality within the electronic prescribing and medicines administration system, multidisciplinary training may not work well.

- Training is best delivered using a role-based approach tailored to specific disciplines and working through the basic functions of the system required for that discipline. For example, administration functionality for those undertaking drug administration rounds and prescribing functionality for medical and non-medical prescribers.

- Training is adapted to roles, specialty and areas of expertise (for example differing guidance on dose in paediatrics compared to adults, anaesthetists rarely complete discharge letters and some pharmacists may have prescribing rights).

- Training is delivered in a consistent manner according to an approved training package to prevent short-cuts and bad habits being introduced (refer to ‘local training materials are developed’ below).

- Training pharmacy staff and medical and non-medical prescribers by pharmacists and nursing staff by other nurses works well:
  - individuals from pharmacy, nursing and medical teams who will be trained by the supplier to be key expert users are identified.
  - to understand the context, these expert users are trained on all the functions of the system, including prescribing and administration.
  - expert users ensure their knowledge of the system is current and up to date.
  - expert users use a ‘train the trainers’ approach to train a suitable number of super-users to cascade the training to their own professional groups using a pre-defined training checklist.
  - the ‘train the trainer’ approach is not without its limitations due to (i) time constraints, (ii) competing clinical priorities, (iii) a lack of initial confidence to deliver the training in this way, and (iv) the risk of a proliferation of bad habits.
  - as well as training new staff, the expert users also provide on-site support to wards during implementation.

- Individual learning styles are recognised and training is adapted accordingly:
  - for example, some users may have little or no familiarity with information technology and might require baseline training with eHealth before receiving training on the electronic prescribing and medicines administrations system.
**Recommendation 2.52**

Training is conducted in small groups.

**Supporting detail**

- Informal training in small groups is preferred.
- Senior medical staff, including consultants, may prefer one to one training.
- The maximum number trained at any one time will be restricted by both the number of available terminals and number of available trainers:
  - access to sufficient terminals for hands-on training may be a challenge.
- As many staff as possible are trained pre-implementation.
- Additional training may be required:
  - for staff who were absent at the time of initial training due to, for example, maternity leave and sickness
  - as a refresher as some aspects may not have been retained following initial training, and
  - at a later stage when there are changes and upgrades to the software.
Recommendation 2.53

Local training materials are developed.

Supporting detail

- Software developer manuals may not reflect local practice and can be misleading as a result. As user manuals tend to be large and few staff have time to study these in detail, specific training materials are prepared locally in advance.

- Local training materials have flexibility to incorporate issues that emerge during ongoing training.

- Training materials to be developed may include:
  - simple user ‘how to...’ guides and crib sheets – some staff may prefer written materials to work through during the training then take away at the end.
  - flow charts with screen shots illustrating specific points.
  - standard operating procedures (SOPs) and frequently asked questions (FAQs).
  - training checklists outlining the key aspects which will be delivered during the training. If NHS board-wide checklists are developed, they may require adaptation for individual hospitals to incorporate local expectations and processes. The training checklist can be used as a step by step guide to demonstrate how to prescribe and/or administer starting with logging on and could include:
    - log-in and out procedures
    - patient selection
    - prescription order entry
    - prescription administration
    - notes function
    - decision support
    - recording allergies, and
    - discharge processes.
  - training documentation to provide an accurate record of who has been trained, when and by whom.
  - authorised written requests to access training.

- It is beneficial to show trainees how prescribing or administration was undertaken on the original paper-based system and then on the new system, highlighting common pitfalls where errors could occur.

- After training, trainee access to a computer to practise with patient test scenarios may be advantageous.
Ongoing training

**Recommendation 2.54**
Existing staff are trained on new functionality.

**Supporting detail**
- Existing staff are trained on new functionality and system upgrades and developments by pharmacist or nurse expert users.

**Recommendation 2.55**
New staff have immediate access to training.

**Supporting detail**
- There are “continually new people showing up” who require immediate access to training (HEPMA, pharmacist).
- Ongoing training is best delivered by pharmacist or nurse expert users.
Recommendation 2.56

Nurses are trained by nurse expert users.

Supporting detail

- New start nursing staff are trained by nurse expert users on the wards with the exception of non-medical prescribers who are trained by the pharmacy project team.

- It is acknowledged that nurses being trained by their nursing colleagues is not ideal as “Chinese whispers” (HEPMA, pharmacist) may encourage bad habits to be passed on. However, it does allow training by staff from their own disciplines who are familiar with drug administration rounds. Provision of structured and standardised training materials and checklists minimise this risk (refer to ‘local training materials are developed’ above).

- Bank nursing staff who generally cover wards at short notice may be trained or untrained, depending on previous experience:
  - bank staff who frequently cover wards using electronic prescribing and medicines administration systems are trained.
  - when untrained bank staff are employed, existing trained ward staff are required to undertake drug rounds.
Recommendation 2.57

Pharmacy teams and medical or non-medical prescribers are trained by the pharmacy project team.

Supporting detail

- Pharmacists and pharmacy technicians are trained on an ad hoc basis as part of their induction process:
  - the relatively small number allows this to be arranged flexibly with the pharmacy project team.

- As there are two new intakes of junior medical staff each year with several rotations, training the large number may be challenging:
  - training is delivered as part of the induction programme for junior medical staff otherwise they will not be able to access the system.
  - junior medical staff are trained before rotating into areas using the electronic prescribing and medicines administration system.
  - those medical staff who may cover wards using electronic prescribing and medicines administration systems only for on-call are trained.
  - online training may be an option in the future as it allows medical staff easy access to the training, as well as auditing to determine uptake of training. However, it cannot determine the level of understanding.

- Experience suggests that induction for medical staff other than juniors (senior medical staff, including consultants) is often poorly defined.

- Locums are frequently employed without warning in an emergency to work for only a short period of time. It can, therefore, be a challenge to deliver training on how to use the electronic prescribing and medicines administration system on time:
  - with sufficient notice, locums are ideally trained in advance, to allow log-in details to be issued.
  - if training cannot be delivered in sufficient time, prescribing is either:
    - left to other medical or non-medical prescribers which causes added pressure on existing teams, or
    - recorded on paper-based charts with the prescription transferred to the electronic prescribing and medicines administration system at a later date by another prescriber. The administration record cannot be transferred.
  - generic log-ins are not be used for locums (Statutory Instrument 2008, number 1692).
Self-assessment checklist with action planning: Leadership and organisational change
This checklist is best completed after you consider the supportive detail which underpins the recommendations.

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Self-assessment</th>
<th>Action planning</th>
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<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
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<tr>
<td>Is there organisation-wide support for the project with strong leadership and ownership from nursing, medical and pharmacy teams?</td>
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<td>Has a formal project plan been devised to ensure a safe and successful implementation?</td>
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<td>Is there a project board, comprising wide stakeholder representation with decision-making capability, to ensure a strongly governed and well executed project?</td>
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<td>Have representatives from key disciplines and users been identified to form the project implementation team?</td>
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<td>Is there an identified pharmacy project lead capable of driving the project in all professional spheres?</td>
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<td>Have approaches to manage the behavioural change accompanying the new system been identified?</td>
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<td>Is there an agreed communication plan to support the project and ensure staff are well informed, engaged and involved?</td>
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<td>Have 24/7/365 support arrangements, for both implementation and ongoing, been agreed as appropriate?</td>
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<tr>
<td>Has organisational agreement and commitment to the training plan been acquired?</td>
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<tr>
<td>Have all healthcare professionals (and all grades) required to use the electronic prescribing and medicines administration system been identified for training?</td>
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<td>Has a training plan been developed?</td>
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<tr>
<td>Have (i) who requires training, (ii) when training will be delivered and (iii) how training will be delivered been considered?</td>
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<td>If training is to be delivered in a classroom environment is there an opportunity for trainees to spend time working hands-on with test scenarios?</td>
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<td>Is there a plan for ongoing training (for example of new staff, locums, bank staff and on upgrades)?</td>
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<td>Have potential risks associated with training been identified and mitigated?</td>
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<td>Has an escalation route been agreed should resistance or non-attendance at training be detected?</td>
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## Technology

### Summary of recommendations

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Drug dictionary and database management</th>
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</thead>
<tbody>
<tr>
<td>3.1 eHealth, nursing, medical and pharmacy teams work collaboratively to determine requirements for equipment to ensure there is adequate availability and accessibility to support clinical processes.</td>
<td>3.7 Maintaining the integrity of the electronic prescribing and medicines administration system is fundamental to assuring patient safety.</td>
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<tr>
<td>3.2 The more user-friendly the electronic prescribing and medicines administration system the better.</td>
<td>3.8 The content of the system is standardised and quality assured.</td>
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<td>3.3 There is acknowledgement in the training programmes that software logic may not reflect human logic.</td>
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<td>3.4 A process for reporting software performance issues is established.</td>
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Security

3.17 It is agreed in advance how user access rights will be determined, approved and set up.

3.18 Each user has a unique account username and password which is not shared.

3.19 Timeout intervals following a period of inactivity reflect both clinical use and security concerns.

3.20 Anti-virus software and firewalls are installed in accordance with NHS board policy.

Contingency and disaster recovery - business contingency planning

3.21 The electronic prescribing and medicines administration system is viewed as a priority by the NHS board.

3.22 Contingency and disaster recovery to prevent service disruption and risk to patient safety is planned.

3.23 If all else fails, a temporary reversion to paper is the final business continuity plan.
**Hardware**

**Recommendation 3.1**

eHealth, nursing, medical and pharmacy teams work collaboratively to determine requirements for equipment to ensure there is adequate availability and accessibility to support clinical processes.

**Supporting detail**

- Determining the hardware requirements ensures that clinical processes are supported and not delayed by the introduction of new technology.

- In determining requirements, consider and plan the following key points:
  - not all devices will be in use at any one time and peaks in clinical activity need to be accommodated by the technology - multiple drug administration rounds and simultaneous ward rounds at specific times of the day.
  - additional hardware post-implementation may be required.
  - if existing devices are sufficient or if new hardware is required - “Use and seek to build on what you’ve got” (HEPMA, eHealth). If using existing devices, determine if portability, speed and functionality enhancements are required.
  - how all devices will be used to access multiple clinical systems on the wards and how to ensure that all access is factored into the equipment requirements.
  - the requirements for equipment, including desktop computers and laptops, are scoped to ensure there will be sufficient hardware for medical, nursing and other staff to use.
  - the requirements for equipment are included in NHS board eHealth plans with ring-fenced commitment.
  - laptops are robust and of high enough specification to allow for multi-application use and to withstand regular use.
  - cost of repairs is considered.
  - the hardware will need refreshing on a regular basis and funding for technological refresh is considered (technological refresh is not unique to electronic prescribing and medicines administration systems).
• To determine the requirements, all ward processes are reviewed (especially ward and drug administration rounds) to determine who, when and where access is required:
  o multiple drug administration rounds and ward rounds can occur simultaneously in a ward.
  o spare devices may also be required.
  o desktop computers are not routinely used for ward rounds and drug administration rounds, but will be needed for back-up support and administrative tasks (for example discharge letters).
  o as typing is required, medical staff may prefer laptops over hand-held touchscreen devices.
  o the accessibility of devices for use by other ward-based healthcare professionals (including pharmacists, physiotherapists and dieticians) is considered.
  o the use of devices for systems other than electronic prescribing which are already used within the organisation (for example laboratory systems) is considered.

• Other hardware considerations frequently neglected are:
  o the availability of suitable numbers of printers in all clinical areas using electronic prescribing.
  o if deploying in outpatients departments, localised printing may be required.
  o the need to purchase bespoke trolleys since laptops might not fit on existing trolleys or the plinth on the trolley may not be able to support a laptop. While height adjustable trolleys allow a suitable working height for all members of staff, there is no ‘one size fits all’ option. Adjustable trolleys may have a large footprint and be large or heavy to move.
  o there are checks that the portable equipment suits users and fits comfortably in the working ward environment, including in ward side rooms.
  o plugs and sockets are easily accessible beside drug trolleys to charge the laptop batteries after use. The estates department will require to be consulted as part of the equipment requirements if there are insufficient plugs and sockets.
  o failing batteries is a major cause of ward disruption and dissatisfaction:
    - consider devising ways to support the habit of charging laptops after use, and
    - it can take more than a month for the practice of plugging the device into the mains power to recharge to become routine.
  o consider the infection control of laptop keyboards in use in clinical areas and engage with the infection control team where appropriate.
Software

**Recommendation 3.2**

The more user-friendly the electronic prescribing and medicines administration system the better.

**Supporting detail**

- It is acknowledged that the set-up of eHealth systems locally is a major determinant of the user-friendly nature of electronic prescribing and medicines administration systems.

- Users frequently find the software frustrating - “It’s the little things” which get buy-in from users and make it work (HEPMA, eHealth):
  - common complaints include prohibited access, timing out after period of inactivity and time for loading.
  - the resultant delay wastes time on ward rounds and drug administration rounds.
  - this situation is problematic on a particularly busy ward (for example acute medical receiving unit) or in critical situations where the patient needs acute treatment (for example sublingual glyceryl trinitrate in acute angina).
  - this issue is related to the set-up of the eHealth systems within the organisation rather than directly related to the electronic prescribing system.

- It is the responsibility of the local eHealth team to ensure local set-up of systems minimises barriers to success:
  - the licensing arrangements associated with the electronic prescribing and medicines administration system are considered to ensure there are sufficient licences to provide access to concurrent users.
  - licence usage is monitored and the number of available licences tailored accordingly.
Recommendation 3.3

There is acknowledgement in the training programmes that software logic may not reflect human logic.

Supporting detail

- Be alert that the software logic may not necessarily follow what a clinician would expect (the software may not reflect clinical practice).
- It is important that socio-technical context, of the clinical staff interacting with the electronic prescribing and medicines administration system, is included in the training programme.

Recommendation 3.4

A process for reporting software performance issues is established

Supporting detail

- There are identified processes for fault reporting, prioritising and agreed timelines for delivering fixes which are proportionate to the nature of the fault.
Deployment and upgrades

Recommendation 3.5
A scalable and sustainable deployment is planned.

Supporting detail

- Plan for deployment of the software and subsequent upgrades via the local NHS board’s eHealth strategy for desktop infrastructure (for example Citrix, VMWare).
- Ideally the preference is for a browser-based application.
- Fat client application is not sustainable for a large NHS board:
  - there would be significant overheads to support local client installation and upgrades (approximately 40 minutes per client).
  - this becomes unworkable since upgrade work on the server requires to be accompanied by upgrades on numerous devices in disparate locations.
Infrastructure

**Recommendation 3.6**

The NHS board’s network is invested in to ensure the technical infrastructure is reliable and supports the application.

**Supporting detail**

- eHealth applications can be deployed safely only if the underpinning technical infrastructure is in place and has a high level of reliability.

- As this is an absolute dependency, investment in the NHS board’s network is crucial.

- The specification for infrastructure considers:
  - what is required and how it will be set up.
  - if existing infrastructure copes with (i) the number of users, and (ii) peaks and troughs in use.
  - the network has adequate coverage, is accessible, functional and robust as it “needs to be up to scratch to run what you want it to run” (CEPAS, pharmacist).
  - the infrastructure is in place across all NHS board sites (not only in the initial HEPMA site or hospital, but in other hospitals within the NHS board area) to enable the network to avoid potential delay with roll-out. Consider remote as well as main hospitals.
  - if arrangements are in place to maintain adequate levels of power to all areas and protect them from power surges. Consider additional requirements for remote and rural locations.
  - if the eHealth team has the necessary skills and knowledge to design and deliver a suitably comprehensive and robust wireless network. Small set-up errors or anomalies can have very far reaching implications. External, expert validation of the network may be of value.

- System users are communicated the overall long term vision and understand there may be issues initially with connections and resilience.
Medicines dictionary and database management

Recommendation 3.7
Maintaining the integrity of the electronic prescribing and medicines administration system is fundamental to assuring patient safety.

Supporting detail

- Maintaining the integrity of the electronic prescribing and medicines administration system, including the drug dictionary and associated tables, ensures consistency in the appearance and use of the system which supports patient safety.

- Creating and maintaining the electronic prescribing and medicines administration system is a significant task, not only before implementation, but also on an ongoing basis as new medicines come into use and new protocols and regimens are required.

- This requires a dedicated resource and limited access for only a small number of authorised staff to make changes to the standing data.

Recommendation 3.8
The content of the system is standardised and quality assured.

Supporting detail

- Terminology is standardised to ensure consistency throughout the system.

- Where possible, a single drug dictionary should support both pharmacy stock control and prescribing systems. This minimises the overheads associated with changes.

- Changes to standing data are accompanied by robust quality assurance arrangements and records.
Integration and interfacing

Recommendation 3.9
Integration with the patient management system is mandatory and is a requirement of the national standards and specification.

Supporting detail

- Integration with the patient administration and management system is mandatory.
- It is important to ensure that the patient index is in the correct data format to export to the electronic prescribing and medicines administration system:
  - this is checked in advance of go live.
  - adequate contingency for data cleansing is ensured as it could otherwise generate technical issues and delay implementation.
  - time and resources are allowed to test and solve any issues which arise and accommodate those that may be onerous or complex to resolve.
  - unexpected issues with the patient administration and management system can delay original planned start dates.
  - although data cleansing may take only a few weeks to rectify, the consequence for the go live date could be a six-month delay to avoid other critical dates, including winter bed pressures and new doctor changeover.
Recommendation 3.10

Integration with other applications is started simply with flexibility to build and develop the system in the future.

Supporting detail

- Ultimately, the aim in NHSScotland is for electronic prescribing and medicines administration to be an integrated package as part of the electronic patient record. The preference is, therefore, for applications and systems to be compatible, including linking acute care and GP systems, for improved information access.
- The initial implementation is not at too advanced a level:
  - start simply with flexibility to gradually develop and grow integration with other applications and systems in the future (for example pathology, laboratory reporting).
  - this recognises that it is not possible to implement everything from the start.
  - it is planned locally how the prescribing system will interact with other clinical systems. It is discussed and agreed whether integration with other systems is from the outset, in stages or as part of the follow-on process.
- Merging the electronic prescribing and medicines administration system with a prescription tracking system enables staff to determine at which point a prescription is in the dispensing process, including clinical check, labelling, assembly, final check and awaiting collection.

Recommendation 3.11

Integration requires advanced information technology skills and resources.

Supporting detail

- Planning interfacing is a “biggie” (HEPMA, eHealth) as it is a critical risk if it goes wrong.
- Interfacing requires advanced IT skills and resources to both deploy and overcome arising issues.
- eHealth and pharmacy project leads need an awareness of Health Level 7 (HL7).
Testing, implementation and maintenance

Recommendation 3.12

The expert resource required for testing, implementation and maintenance is not underestimated.

Supporting detail

- Testing, implementation and maintenance are resource intensive.

- The expert resources required for testing in various test environments (test, training and live) to test both functionality and load are considered.

- A test plan covering what will be tested, when testing will take place and by who is developed, documented with timescales and agreed as part of the project plan.

- ‘Business as usual’ rules for data migration, archiving and testing are developed, agreed and documented.

- Testing is undertaken with strong lines of communication to the suppliers. Ideally sharing of findings is a two-way process between client and provider to best develop the system.
Recommendation 3.13

Full end-to-end performance testing of all technical aspects of the system is undertaken in advance of go live.

Supporting detail

- **Network connectivity:**
  - To ensure 100% access and sufficient coverage, the wireless network is tested against devices one month before, one week before and one day before go live.
  - All rooms in wards are checked for coverage to ensure there are no black spots causing communication failures.
  - There is awareness that metallic Christmas decorations may interfere with the wireless network.

- **Software:**
  - The functionality of the electronic prescribing and medicines administration system (admission, prescribing, administration and discharge) in various clinical circumstances is tested - this determines how the software deals with many different scenarios.
  - Consider who will develop the test scripts (supplier or internal pharmacy and eHealth teams) - if it is the supplier, the script is reviewed and, if required, supplemented with additional scripts to test functionality and clinical scenarios.

- **Interfacing:**
  - The patient index is in the correct data format to export to the electronic prescribing and medicines administration system.
  - Adequate contingency for data cleansing is allowed as integration can generate technical issues and potentially delay implementation.
  - Patient journeys throughout the hospital(s) are simulated with the live patient administration system data - this identifies any interfacing issues early.
Recommendation 3.14

Testing and implementation of future upgrades is carefully scheduled.

Supporting detail

- New versions of the software are tested, often over a prolonged period of time.
- Consideration is given to the pooling of resources between NHS boards in relation to testing where this would be mutually beneficial.
- Upgrades are carefully scheduled as they can take up to eight hours to install - overnight is the best time to undertake lengthy upgrades to minimise disruption to ward routines.
- Decision support software should be updated regularly (for example monthly). A time when the update will not affect drug administration times is selected (for example early morning – 6.00am may be a suitable time).

Recommendation 3.15

Upgrades are communicated, in advance, to users.

Supporting detail

- Information on planned downtime and upgrades is communicated in advance:
  - meetings with ward staff are arranged to allow them to choose a convenient time to fit the upgrade with ward routines (for example between drug rounds).
  - it may also be valuable to prepare posters to display in clinical areas informing staff of upgrades.
  - consider if the eHealth team could distribute a standard system notice in advance of any periods of downtime. This is a structured email providing contact details and detailing:
    - why there will be downtime
    - what systems and services will be affected
    - who will be affected, and
    - when and how long the downtime is planned for.
  - communicating unplanned downtime:
    - this is best undertaken using a cascade approach within teams via the ward clinical pharmacists and technicians, and
    - each ward and medical team is contacted with an update on what is happening.
Recommendation 3.16

A process to receive and respond to feedback from users is established.

Supporting detail

- These processes should be responsive and transparent.
- A process is set up for nursing, medical and pharmacy system users to provide feedback on concerns or user acceptance of the electronic prescribing and medicines administration system.
- User development requests can be accomplished through the existing project support structure and/or online tools.
- Providing users with a means of feedback identifies issues for follow-up and development by the project implementation team and encourages the software supplier to develop or improve the safety and design of future software.
- Work in partnership with suppliers to prioritise development requests and incorporate these into new builds and upgrades at a mutually agreed time.

Security

Recommendation 3.17

It is agreed in advance how user access rights will be determined, approved and set up.

Supporting detail

- It is collectively agreed which roles have access to which level of data (for example for prescribing, administration and view only access).
- It is agreed in advance how new user access will be determined, approved and set up (for example agree if this will be a local decision within a hospital site or across the NHS board).
- Only the system administrator has access rights to change software settings.
Recommendation 3.18

Each user has a unique account username and password which is not shared.

Supporting detail

- Electronic prescribing and medicines administration systems require an electronic signature to be accepted against the prescription of a medicine. Statutory Instrument 2008, number 1692 defines the requirements for prescriptions in electronic form.
- Generic log-ins are not acceptable for electronic prescribing and administration systems.
- Each user is provided with a unique account username and password:
  - usernames and passwords must not be issued until training has been undertaken.
  - usernames and passwords to log in are not to be shared.
  - staff are trained not to access the system under a colleagues’ user log-in.
  - this is addressed within the NHS board’s eHealth security policies.
  - the need for strict personal discipline with passwords, logging off and security is regularly reinforced (password protection is the personal responsibility of individual users).
  - users may become frustrated at frequently having to change their passwords and are informed that this is for security purposes.
- Users have individual accountability for their own prescribing and administration activities and there is a full auditable trail of all prescribing and administration transactions.
- An accurate central list of users and sign-on details is maintained and user accounts are reviewed quarterly.
- The risks and benefits of including electronic prescribing and medicines administration in a single sign-on solution are considered.
Recommendation 3.19

Timeout intervals following a period of inactivity reflect both clinical use and security concerns.

Supporting detail

- The timeout interval following a period of inactivity reflects clinical use.
- As security and clinical use must co-exist, timeout settings are set up pragmatically.
- Users are trained to ensure they log out at the end of their session.
- Users are encouraged to “self-police” (HEPMA, eHealth) to avoid the inadvertent use of their account by a colleague.

Recommendation 3.20

Anti-virus software and firewalls are installed in accordance with NHS board policy.

Supporting detail

- Device encryption is an individual NHS board decision based on an assessment of the risk of electronic prescribing and medicines administration and other clinical systems used on the devices.
- Security features do not present a barrier to the quick use of the system.
Contingency and disaster recovery - business contingency planning

Recommendation 3.21
The electronic prescribing and medicines administration system is viewed as a priority by the NHS board.

Supporting detail

- The electronic prescribing and medicines administration system is viewed as a priority by the NHS board.
- If the system goes down, every effort is made to get it back up and running as soon as possible.
- The electronic prescribing and medicines administration application is included in hospital business continuity plans to enable appropriate prioritisation of the emergency generator circuit.
Recommendation 3.22

Contingency and disaster recovery to prevent service disruption and risk to patient safety is planned.

Supporting detail

- There is a significant (and obvious) need for careful business continuity planning to deal with server events and prevent service disruption.

- Business continuity planning is standard across the NHS board for all eHealth applications and not only for the electronic prescribing and medicines administration system.

- All sites plan for resilience by examining every possible point of failure and develop and test their business continuity plans before implementation. The back-up and restore regimen is also tested:
  - the mains power supply is reliable.
  - in the event of a mains failure, an uninterrupted power supply (UPS) protects shadow servers and keeps them running - paper medicines administration charts can be printed from there.
  - the network is resilient - if the wireless network fails, the hard-wired network can still provide clinical access on a temporary basis.

- All staff who may be called to support a major failure are appropriately trained to deal with potential situations and have access to up-to-date and accurate standard operating procedures.

- Communication with users during unplanned downtime is essential (refer to ‘communication’ in ‘leadership and organisational change’).
Recommendation 3.23

If all else fails, a temporary reversion to paper is the final business continuity plan.

Supporting detail

- There should be clear criteria for decision-making when reverting to paper is enforced (for example duration of downtime).

- The decision to revert to paper is a clinical, not eHealth, decision based on all available information.

- Each site has the ability to revert to paper if required.

- Each site has the capability for printing paper medicines charts which contain an accurate and up-to-date version of patient prescribing and administration records (for example using a computer in the pharmacy which can operate in isolation if the client or network fails on site).

- The move to paper is not delayed unnecessarily as continuity of care to the patient remains the priority at all times.

- The NHS board may choose to operate with a main server at one site and shadow servers at other hospital sites, the number of which would depend on volume of use.

- Consideration is required when reinstating the electronic prescribing system:
  - the decision-tree will reflect the time the system has been unavailable and the prescribing activity that has been undertaken during the period the paper-based system has been used.
  - this is a key decision point and may, in extreme cases, require all patients to have new prescriptions created on the system.
# Self-assessment checklist with action planning: Technology

This checklist is best completed after you consider the supportive detail which underpins the recommendations.

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<th>Criteria</th>
<th>Self-assessment</th>
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**Case studies**

- Have equipment requirements been determined to ensure adequate availability and accessibility for users on wards?
- Has a process been established to report software performance issues?
- Is there a plan for a scalable and sustainable deployment of the system?
- Is investment in the local network required to ensure the infrastructure can reliably support the application?
- Has a suitable test plan been developed and agreed covering full end-to-end performance testing in advance of go live?
- Has determining, approving and setting up user access rights been agreed in advance with each user having a unique username and password?
- Are security arrangements in place in accordance with local policy (for example anti-virus software and firewalls)?
- Is the electronic prescribing and medicines administration system being viewed as a priority in hospital business continuity plans to prevent service disruption?
Case studies

Background

Case studies are included from five NHS boards – they are all at a different stage of planning or implementing an electronic prescribing and medicines administration system.

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<th>NHS board</th>
<th>Current stage of planning or implementation of an electronic prescribing and medicines administration system</th>
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<td>Early planning</td>
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<td>NHS Grampian</td>
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<td>NHS Ayrshire &amp; Arran</td>
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The case studies illustrate different NHS board approaches to business planning and/or implementing electronic prescribing and medicines administration systems. While each NHS board’s case study is unique, each provides:

- a short background to their individual experiences
- some of the challenges faced
- how the challenges were addressed, and
- key lessons learned.
NHS Highland: Early planning

NHS Highland is currently exploring options for the safe implementation of electronic prescribing and medicines administration across the NHS board. A project group has been set up to develop a business case to submit to the NHS board by early 2014. This case study presents some of the challenges faced and how they were addressed.

Covering nearly 40% of Scotland’s geographical area, NHS Highland serves approximately 310,000 population. The widely dispersed population on islands and remote and rural areas poses a challenge to service delivery. While Raigmore Hospital in Inverness is the only acute general hospital serving the Highland population, there are also three rural and a number of community hospitals. The 452 bedded Raigmore Hospital offers a range of clinical specialties including medical, surgical, maternity and cancer services.

Key drivers

A number of local service delivery issues requiring improvements in the safety, quality, effectiveness, efficiency and timeous prescribing and administration of medicines were identified.

- NHS Highland recognises that although the existing paper-based system is efficient, it is not as effective – prescribing and administration errors are detected on a regular basis.

- The integration of health and social care within the NHS board has highlighted various clinical issues relating to medicines governance.

- The NHS board’s geography results in a large proportion of patients being treated at a distance. These patients should receive the best possible care delivered close to their homes (for example by district nurses).

- Desire for a robust audit trail of medicine prescribing and administration.

The positive experience of prescribing and administering chemotherapy electronically since 2001 has given NHS Highland the confidence and belief to further develop electronic prescribing and medicines administration. The facility to view data at a distance and to transfer prescribing and administration records electronically to satellite facilities has reduced the need for many patients in the Highlands to travel long distances to receive chemotherapy.
The chemotherapy electronic prescribing and administration system delivered and exceeded expectations with clear benefits to both staff and patients and this is being used to inform discussions. With the chemotherapy prescribing and administration system in NHS Highland, high quality prescribing of complex therapy is delivered effectively and efficiently through easy accessibility of patient information to the clinical team. Patients transfer more quickly through the system and there is increased time to discuss their specific care needs.

Despite initial problems, users would not wish to return to the previous paper-based system. The NHS board translated the positive experiences with the chemotherapy prescribing and administration system to the benefits which a generalised electronic prescribing and medicines administration will bring. The NHS board recognised the potential benefits for:

- **prescribing:**
  - improved patient safety
  - increased quality of prescribing
  - reduced prescribing errors
  - reduced variation

- **administration:**
  - improved patient safety
  - increased doses given on time
  - fewer omitted doses
  - reduced waste.

By improving both the effectiveness and efficiency of prescribing and administration, staff time could be released to care, which in turn could adopt a more person-centred approach.

In autumn 2012, an associate medical director, director of pharmacy and principal clinical pharmacist agreed that current systems for prescribing and administering medicines using a paper-based drug chart were becoming unsustainable and electronic prescribing and medicines administration systems might be a potential solution to address the existing issues. Medication-related errors are the second most common incident reported within NHS Highland. Of these, omitted medicines are the most frequent cause, followed by unclear and incomplete prescribing.

Their expectation of an electronic prescribing and medicines administration system is (i) to provide ‘forcing functions’ which requires the already legible prescription to be complete and (ii) to generate alerts when a medicine has not been recorded as administered. A site visit to NHS Ayrshire & Arran in January 2013 furthered the desire to introduce an electronic prescribing and medicines administration system locally.
Securing professional leadership and agreement to scope

By spring 2013, the support and professional leadership of the major professional committees was secured including the area medical committee, area drug and therapeutics committee, area pharmaceutical committee, nursing, midwifery and AHP committee and eHealth strategy group. A paper was subsequently developed to be tabled at the senior management team to seek approval to develop a project group to start scoping and business planning for a potential electronic prescribing and medicines administration system.

A lesson learned was that while clinical staff could readily understand the merits of such a system, senior managers were not as aware of the potential benefits (and risks) of such a system. With hindsight, a pre-meeting discussion with individual senior managers to set the context would have been conducive to a more effective meeting with them as a group.

Forming the project board

Following approval, a project group was formed in May 2013, comprising representatives of all the key professions within the organisation - medical, nursing, pharmacy, eHealth, management and finance staff from not solely Raigmore Hospital, but also other hospitals across the NHS board area. Gathering everyone together regularly in a geographically dispersed board like NHS Highland is a challenge (even using video-conferencing facilities). Those with the most flexibility in their diaries are usually those who are also least likely to use the system on a daily basis.

Exploring the software

In September and October 2013, the project board arranged for a number of suppliers of electronic prescribing and medicines administration systems to visit to allow potential users to ‘play’ with the systems, test their functionality and determine the extent to which they are user friendly and intuitive. There is currently only one agreed supplier as part of national procurement. National support to advise on alternative options would be advantageous in empowering local decision-making capability.
Planning

If funding can be secured for an electronic prescribing and medicines administration system, roll-out will begin on completion of the patient management system implementation (expected by the end of the financial year 2014-2015). The project board is aiming to prepare a business plan for an electronic prescribing and medicines administration system by the beginning of 2014 for submission to NHS Highland to release funding investment. If approved, this will allow a full year of preparation and planning for implementation. It would also avoid too much change for staff with two systems being introduced simultaneously.

The support and professional leadership of the major committees was secured early in the planning process.

Identifying and addressing barriers

Significant barriers to the successful implementation of an electronic prescribing and medicines administration system within NHS Highland have been identified and potential solutions are currently being explored:

- identifying the financial resource to fund the project
- identifying the project support to deliver the project, including clinical, eHealth and management teams
- unknown complexities are anticipated with interfacing with the patient management system (PMS)
- clinical staff reluctance, and
- complexity of managing different systems in northern NHS Highland and Argyll and Bute.

While the challenge for smaller NHS boards such as NHS Highland is in identifying sufficient staff to support an electronic prescribing and medicines administration project, equally the advantage is that they have a greater degree of flexibility and can move more deftly due to the smaller number of staff and groups to be consulted.
NHS Grampian: Developing a business case

NHS Grampian is currently developing a business case to support the safe, incremental introduction of an electronic prescribing and medicines administration system in line with NHS board priorities. This case study presents some aspects of their business planning experiences and the specific challenges encountered during the process.

The NHS board serves Grampian’s half million population across 3,000 square miles of cities, towns, villages and rural communities. NHS Grampian has a number of acute and community hospitals offering a range of clinical specialties including paediatrics, maternity, care of the elderly, mental health and palliative care services. Aberdeen Royal Infirmary is the largest hospital with 900 beds.

Key drivers

Electronic prescribing and medicines administration has been a vision for almost a decade. The patient management system (PMS) was implemented in 2011 and electronic prescribing and medicines administration is recognised within the NHS board as the next significant clinical and eHealth improvement. There are three key drivers to change the way medicines are currently prescribed and administered within the NHS board:

- to enhance patient safety by improving prescribing and administration processes
- to improve the quality and flow of information both within and outwith the hospital at each point of patient transfer including on admission and discharge, and
- to improve the information available for audit and provide a robust audit trail.

Convening a local working group

A local working group was convened with responsibility to develop the business case to secure funding and plan for implementation. As the NHS board is keen for the system to be viewed as a clinical system rather than as solely an eHealth or pharmacy project, clinical engagement is crucial. Membership of the group includes representatives from eHealth, medical, nursing, finance and pharmacy teams with the eHealth clinical lead as the chair.
Developing a business case

A draft business case for an electronic prescribing and medicines administration system is currently being prepared, with 2014-2015 as the target date for implementation. The business case, which will be submitted to the NHS board’s Asset Investment Group for approval to release capital budget funding and agree revenue funds to support project and change management, is currently well developed with sections focusing on:

- background and context
- benefits
- strategic context and benefits of change
- local context and case for change
- scope service requirement and key stakeholders
- option appraisal
- financial summary, risk analysis, economics appraisal, and
- recommendations, including workflow, training, implementation and phases.

Benefits realisation

Benefits realisation is one of the most important, but most challenging, sections to complete. As the financial outlay must be justified, measures need to be applied to potential outcomes including the less tangible ones. Filling blank sections of the business plan can, therefore, be daunting, especially estimating avoidable medication errors and potential impact. One supplier of electronic prescribing and medicines administration systems commissioned an independent management consultancy to develop a ‘benefits matrix’ for use by clients and customers globally to support them specifically with this recognised difficulty. The benefits matrix is a benefits calculator tool which uses local figures from the customer relating to what they perceive the benefits to be for them and generates reports on expected benefits (for example impact on time savings and length of stay which may offer potential cash-releasing benefits). This benefits matrix was of some value in preparing the business case. The plan is to evaluate these projected benefits post-implementation to measure progress against key objectives, including reduction in prescribing and administration errors.
The benefits analysis section [of the business case] is the most important and one of the most difficult to do...it is difficult to plug in information and numbers on outcomes into a blank canvas.

Implementation plan and review

An implementation plan is currently in development and, pending decision, the initial scope is expected to include Aberdeen Royal Infirmary as well as the Royal Aberdeen Children’s Hospital and Aberdeen Maternity Hospital. These are also housed on-site with Aberdeen Royal Infirmary and the Royal Cornhill Hospital which provides mental health services. Further safe and incremental roll-out across the NHS board is planned. Crucially, a post-implementation review is also being considered at this early stage to monitor progress and evaluate implementation to ensure the initial anticipated benefits are realised and lessons learned are incorporated into the next phase of implementation.
NHS Dumfries & Galloway: Approval of a business case

A business case for the implementation of an electronic prescribing and medicines administration system across NHS Dumfries & Galloway was approved by the NHS board’s executive team in November 2013. This case study presents both their business planning and early implementation planning experiences.

The NHS board serves a population of approximately 148,000 over a large geographical area of 2,400 square miles. The main acute hospital is the 337 bedded Dumfries & Galloway Royal Infirmary which covers a full range of clinical specialties. The NHS board’s population is also served by a 60 bedded community hospital providing inpatient and outpatient medical, surgical and maternity services, an 85 bedded mental health facility for inpatient care and eight cottage hospitals providing various health services including assessment of adults, rehabilitation and palliative care.

Focusing priorities

The safe, incremental introduction of an electronic prescribing and medicines administration system has been a vision for the last two years. During this time, planning for a new hospital to replace the existing main acute hospital helped focus priorities on electronic prescribing and medicines administration. The aim is to have a modern, fully functional hospital by 2018 which is fit for purpose and uses electronic and automated systems where appropriate. There were two key reasons increasing the urgency on the NHS board to develop and obtain approval of a business case for an electronic prescribing and medicines administration system.

1. Introducing electronic prescribing and medicines administration when staff are already coping with the culture change of a new hospital, geography and ways of working brings additional unnecessary risk to patient care. To mitigate the risk, the preferred approach is to embed the electronic prescribing and medicines administration system as routine work practice within the existing hospital in the next few years. This would ensure familiarity with the system before the move to the new hospital.

2. The NHS board’s pharmacy stock management system operates using the JAC system. JAC’s electronic prescribing and medicines administration system is the only option available to NHSScotland under the national patient management system (PMS) procurement framework until January 2014. The plan was, therefore, to obtain approval, release funding investment and place an order for the JAC product before this deadline. The NHS board explored alternative options, including the Ascribe product. However, these were limited by the timing by which progress was required to keep in line with NHS board priorities for the new hospital build.
Forming a multidisciplinary team

Early 2013, a multidisciplinary group was formed to develop the business case for the electronic prescribing and medicines administration system. The group, chaired by the medical director, included representatives of all the key professions within the organisation, such as medical, nursing, pharmacy, eHealth, management and finance teams. It was beneficial that all representatives were positive advocates of electronic prescribing and medicines administration from an early stage.

Visiting other sites

The multi-professional team visited NHS Ayrshire & Arran and NHS Lanarkshire to see electronic prescribing and medicines administration using the JAC system in operation. They were impressed by what they witnessed and recognised that there were three factors critical to the success of the project - preparation, staff engagement and communication and ongoing support for clinical users. Consequently, the team returned enthused and willing to progress implementing the electronic prescribing and medicines administration system across the NHS board.

“Visiting other sites with hospital electronic prescribing and medicines administration systems increased the enthusiasm and willingness of the multidisciplinary team to progress with our business case...we were impressed with their use and what it did for them.”
Approval of business case

The business case was approved by the NHS board’s executive management team in November 2013. On receiving the positive decision, the group began to progress:

- purchasing the JAC system
- identifying a dedicated team to ensure the project is managed effectively with an eHealth project manager and a pharmacy clinical project lead, and
- devising a formal project plan.

Planning and evaluation

The vision is for implementation of the electronic prescribing and medicines administration system across the NHS board area over a two-year period to allow approximately 18 months bedding in before the new hospital opening in 2018. The plan is to implement initially in the three care of the elderly wards in the acute setting. The multidisciplinary team in one of these wards in particular has a history of success on a number of medicines-related projects (medicines reconciliation, discharge communication and medicines safety) and this ward is, therefore, the obvious choice as the initial go live site.

There will be a period of evaluation with the lessons learned incorporated into the quick roll-out of the electronic prescribing and medicines administration system across the other two wards. While the initial implementation plan has been decided, later stages are currently being considered to ensure a safe and successful roll-out across the NHS board.
Area drug and therapeutics committee

The area drug and therapeutics committee (ADTC) was integral to the decision-making process and is strongly supportive of the plan. The ADTC has a key role in medicines governance, and will provide a crucial forum to communicate patient safety and risk mitigation issues associated with the electronic prescribing and medicines administration system as it is being implemented and thereafter. Several members of the multidisciplinary group developing the business case and implementation plan are also members of the ADTC. Prescribing in the NHS board’s cottage hospitals is undertaken by GPs, some of whom are also members of the ADTC. This ensures a fully rounded approach to implementation, and emphasises the key role of the ADTC in this project.

Reflection

On reflection there are few things the NHS board would have done differently in the development of its business plan. The process was (i) straightforward due to the strong desire to implement the electronic prescribing and medicines administration system in advance of the new hospital move, and (ii) conducted over a short timescale due to the January 2014 deadline imposed by the national PMS contract. Had the organisational clarity described in (i) been absent, the focus on benefits realisation within the business case would have needed to be stronger. This might have proved challenging given the current limited evidence base. The NHS board did not use JAC’s ‘benefits matrix’, a benefits calculator tool which uses local figures to generate reports on expected benefits. The NHS board thought that the matrix was not sufficiently focused on issues important to it and would, therefore, not help the development of their benefits realisation case. Furthermore while rapid progress was made in the development of the business case and approval was obtained on time, there were frustrations that early discussions focused prematurely on detailed issues (for example on a detailed implementation plan) rather than outlining the business case. Although at that stage it was felt time was being wasted, ultimately it was beneficial as the NHS board was in the fortuitous position of having a well-developed implementation plan at the outset of the project.
NHS Lanarkshire: Recent implementation

In March 2013, NHS Lanarkshire successfully implemented an electronic prescribing and medicines administration system for 64 beds within the three care of the elderly wards in Monklands General Hospital, a district general hospital with 535 inpatient beds and a 24-hour accident and emergency department.

Key drivers

The key local driver for implementation was to improve medicines safety, one of the six aims of the eHealth Strategy for NHSScotland 2011-2017. There was also a desire to demonstrate that an electronic prescribing and medicines administration system could be successfully achieved drawing on the wealth of experience from NHS Ayrshire & Arran.

Funding

Approximately £200k of the NHS board’s £2m eHealth strategy fund over both 2011-2012 and 2012-2013 was used to support both project and change management. An additional £100k from the 2011-2012 capital budget funded JAC software and licences.

System choice

The choice of system supplier was governed by the national Patient Management System procurement process. Electronic prescribing and medicines administration was included as an optional module in this procurement and JAC was the successful bidder. It was also convenient that the pharmacy’s stock control operates using the JAC system.
Timescales

Frution from idea to implementation took approximately three years – one year for initial informal discussions, one year planning and one year of active engagement. Although this could have been achieved in a shorter timescale, the NHS board was keen not to assign definitive deadlines, but instead implement steadily at a pace which did not incur unnecessary pressure to the day-to-day running of the selected wards.

There was a delay of six months from the original planned implementation date of October 2012, due to an unexpected interfacing issue with the patient administration system. Although data cleansing to rectify the issue took only a few weeks, the consequence for the go live date was a six-month delay to avoid both winter bed pressures and the new doctor changeover. This highlights the necessity to select a go live date carefully.

Assessment

There were three factors contributing to the success of the project:

• preparation
• engagement and communication, and
• support.

The project implementation team facilitated and co-ordinated the change and also engaged and liaised with pharmacy, medical, nursing and eHealth teams not only in the unit, but also across the hospital. The commitment of this team was crucial and the support they offered their peers was testament to successful implementation. The project implementation team reported to a project board which had responsibility for overall project governance. Whilst a key function of the project board was to assist the implementation team to overcome any problems, this fortunately was something they had little need to do. Significant time was spent, during the planning phase, engaging and communicating with staff from the pilot wards to gain their support and buy-in to the project. This was worthwhile as the project was welcomed with no push back at implementation.

“The project implementation team warmed staff up from all sides...talking went on all the time with nursing and medical staff so nothing came left field.”
The project board agreed that all clinical matters relating to implementation were to be considered and approved by the area drug and therapeutics committee (ADTC). During the planning phase, a presentation was given to the ADTC to make members aware of both the project and their role in it. Consequently, electronic prescribing and medicines administration became a standing item on its agenda. As the project implementation went smoothly, there was little reliance on the project board to address major issues.

Lessons learned

On reflection, key lessons learned to ensure a project is successfully delivered and well executed are:

- the use of formal project management methods for planning and controlling the project
- the clarification of roles and responsibilities at the outset
- ensuring the appropriate ICT infrastructure is in place including wireless coverage that has been tested in all ward areas
- appointing key senior champions identified from nursing, medical and pharmacy areas, and
- ensuring strong and consistent stakeholder engagement with all clinical, pharmacy and eHealth teams is maintained throughout the project - this has been identified as the key lesson.

The implementation is considered a pilot for two reasons:

- it employed non-recurring funding, and
- it provided the opportunity to learn from the experience for potential further roll-out.

Review

Although qualitative evidence from a user perspective strongly suggests that the electronic prescribing and medicines administration system has been successfully implemented into routine practice, a formal evaluation is currently under way to review lessons learned and ultimately inform decisions on sustainability and future roll-out.
NHS Ayrshire & Arran: Early adopter

NHS Ayrshire & Arran, serving a population of approximately 400,000, was the first NHS board in Scotland to deploy an electronic prescribing and medicines administration system. Gradually over a number of years, the electronic prescribing and medicines administration system has been successfully implemented in University Hospital Ayr, one of the NHS board’s two university hospitals. The system was also successfully implemented in 2009 in Biggart Hospital, a small hospital offering care of the elderly and rehabilitation services, and in late 2012, in the mental health unit at University Hospital Crosshouse, the NHS board’s other university hospital. An accelerated implementation plan is currently under review for further roll-out across the latter. In 2013, the system was also implemented in the intensive care unit (Crosshouse) and in Arran War Memorial Hospital, Lamlash, Arran.

Key drivers

The journey towards electronic prescribing and medicines administration began in the mid-1990s at which time there were three main drivers for changing how medicines were prescribed and administered within what was then the South Ayrshire Hospitals NHS Trust:

- poor compliance with prescribing and medicines administration standards
- medication errors, and
- implementation of the HBOC hospital information system (HIS) with capability to support electronic prescribing and medicines administration.

The market options for electronic prescribing and medicines administration were explored and, at that time, were limited to the HBOC US-based integrated pharmacy and prescribing system and an emerging UK system being marketed and developed by JAC. Following a visit to Greenwich Hospital, London, where the HBOC electronic prescribing and medicines administration system had been implemented, it was agreed to follow a ‘best of breed’ path. University Hospital Ayr then worked with JAC to develop a UK compatible electronic prescribing and medicines administration application. Since it was one of the main UK early adopter sites, the JAC software costs were heavily discounted. As the project progressed, decisions were taken to fund roll-out of the electronic prescribing and medicines administration system to Crosshouse through the NHS board’s eHealth strategy.
At this time, information technology was not well developed and electronic prescribing and medicines administration was largely unknown in the UK. Despite these limitations, the Trust Directors agreed to progress and underpin the risk on the basis that the “electronic prescribing and medicines administration system was no less safe than the existing paper-based system.”

**Professional leadership**

The project was sponsored by the area drug and therapeutics committee, led by the chief pharmacist and supported by the executive medical, nursing and finance directors and the eHealth department.

**Early implementation**

The orthopaedic unit in University Hospital Ayr was identified as the pilot site as it was a self-contained unit with the fewest patient transfers. The system was implemented in May 1998 and a quantitative project to evaluate the benefits was undertaken.¹ The results are shown in Table 1.

<table>
<thead>
<tr>
<th>Evaluation criteria</th>
<th>1 month</th>
<th>1 year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reduction in prescribing non-conformances</td>
<td>5%</td>
<td>36%</td>
</tr>
<tr>
<td>Reduction in administration non-conformances</td>
<td>33%</td>
<td>39%</td>
</tr>
<tr>
<td>Reduction in discharge prescribing events</td>
<td>-3%</td>
<td>21%</td>
</tr>
<tr>
<td>Medicines given on time +/- 60 minutes (baseline 92%)</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
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This evaluation, comparing baseline, one month and one year post-implementation data, clearly showed the significant benefits which could be achieved through an electronic prescribing and medicines administration system. It is important to note that this evaluation focused on patient safety rather than any economic assessment. This indicated that the electronic prescribing and medicines administration system was at least as safe as the original paper-based system.

Despite this success, it was agreed that the application required significant improvement before it could be deployed more widely. Using the lessons learned from the orthopaedics implementation, University Hospital Ayr worked closely with JAC and other UK Trusts to develop the software to make clinical end use easier.

Development of the system

In 2001, the application was rolled out to the medical wards within University Hospital Ayr. There followed a further software development cycle to accommodate a range of surgical specialties, and in 2006, the electronic prescribing and medicines administration system was implemented in all surgical wards. Electronic prescribing and medicines administration is now used on all wards within University Hospital Ayr (excluding accident and emergency, theatres and intensive care).

In 2009, the system was deployed ‘off-site’ at Biggart Hospital and, in 2012, was deployed in two mental health wards at University Hospital Crosshouse. An accelerated implementation plan is currently under review for further roll-out across University Hospital Crosshouse.

Challenges

Three main challenges have emerged as the journey has progressed: software, infrastructure and implementation.
Software 20%:

As with any new prescribing system, there was concern about its safety in clinical practice. Understanding the human factors involved when interacting with technology has been important as has been the need to understand the unintended consequences of such change. Confidence now exists that the application itself offers a stable platform and patient safety is improved, although the type of errors reported has changed.

Infrastructure 30%:

eHealth applications can only be deployed safely if the underpinning technical infrastructure is in place and has a high level of reliability. This is an absolute dependency. eHealth teams must be provided with the knowledge and capability to support bedside applications where wireless networks (wLAN) are essential. In 1999, wireless technology was available, but not well understood. By 2004, the wLAN was becoming increasingly unreliable and the entire project was at risk of failure due to the high number of support calls (24/7) that were placing an unsustainable demand on the expert pharmacy out-of-hours support. An external consultant was appointed to review the network to diagnose and resolve the underlying issues. This, alongside deployment via CITRIX (rather than as a FAT client application) improved bedside access to an acceptable level. The need to provide the eHealth team with education and training when introducing new technology was a lesson learned. An ongoing infrastructure challenge is associated with the number of hardware devices required for clinician access to such bedside applications.

In addition to the technical infrastructure, electronic prescribing and medicines administration applications depend on other hospital information systems to manage patient demographics and admission transfer and discharge (ADT) transactions.

Lack of real-time ADT functionality at Crosshouse Hospital was the major limiting factor associated with implementation of the electronic prescribing and medicines administration system.
Implementation 50%:

Managing the change process and adapting the culture from one reliant on paper to use of technology has been the biggest challenge. Preparation, training, one-to-one support during the changeover and ongoing support is critical. Pre-implementation classroom training is of limited value, the greatest training impact occurs during the implementation phase with one-to-one coaching.

The wider learning from the NHS Ayrshire & Arran implementation is referred to in the recommendations and covers:

- the need for robust contingency and disaster recovery processes
- recognition that the risks will change when moving from paper to electronic prescribing and medicines administration systems and the need for good risk management procedures
- the essential requirement for visible senior leadership to ensure that staff using the system are supported during the change process
- the need for excellent working relationships and a true partnership between eHealth and the clinical teams
- the need for a professional project manager to support the clinical and eHealth teams and to keep the project to time
- the ongoing expertise and resource required to maintain and update such systems
- the need for 24/7 support at all levels, and
- the need for robust incident management.

“During the change there should be visible senior leadership to offer support to those using the system at grass roots level.”
Reflection

The timescale of the NHS Ayrshire & Arran project has been considerable. However, with the tools and technology available at the time of implementation it is unlikely progress could have been more rapid.

The system has a high level of user acceptance at both Ayr and Biggart hospitals. The system facilitates prescribing, administration, medicine supply and the creation of the discharge document.

At the time of writing, implementation in University Hospital Crosshouse is imminent. This is subject to the required infrastructure being in place to support the application, the end user and to ensure patients are not placed at risk.

Greater pace around local implementation would have been beneficial as would the pace of software development from the supplier, although this has improved more recently. One regret is the lack of resource to carry out more formal evaluation of the benefits supported by academic expertise. The time required for such evaluation was beyond local resources and academic interest at the time was limited.
Benefits realisation
Benefits realisation

Key messages

NHSScotland experience to date indicates that hospital electronic prescribing and medicines administration systems provide an important foundation for improving the safe and effective use of medicines thereby providing an opportunity to enhance patient safety in both acute and primary care settings.

However, as yet, there is relatively limited published evidence on the benefits of electronic prescribing and medicines administration in improving outcomes for patients. In addition, evaluating the impact of electronic prescribing and medicines administration systems is complex and internationally there is agreement that costs cannot at present be readily ascribed to the benefits of these electronic systems.

NHSScotland supports the approach to benefits realisation that is focused on the broader strategic and quality benefits of electronic prescribing and medicines administration systems linked to NHSScotland policy and strategy. It is expected that this will ultimately accrue financial benefits. NHS board business cases should be based primarily on the safe and effective use of medicines, whilst recognising the potential indirect financial benefits arising from patient, quality and strategic benefits (for example a reduction in medication errors and potential efficiencies in nurse time spent administering medicines).

Considering how progress with implementation will be monitored and evaluated to ensure the benefits are realised and unforeseen or unanticipated consequences are identified is recommended. This will help inform decision-making not only in local NHS boards and across NHSScotland, but also internationally.

While the commission has provided clarity on current evidence and expert opinion on benefits realisation, it will be important to review emerging learning as experience of implementing electronic prescribing and medicines administration systems in NHSScotland grows. It is considered that investment in long term resources for developing and improving electronic prescribing and medicine administration systems will be necessary to realise the anticipated benefits.
1 Introduction

There is consensus within NHSScotland that hospital electronic prescribing and medicines administration systems provide a foundation for improving the safe and effective use of medicines thereby providing an opportunity to enhance patient safety in both acute and primary care settings.

Electronic prescribing and administration systems are still emerging. Although their potential to improve patient care is considered to be extensive, widespread implementation of prescribing and administration of medicines within and across countries remains limited globally. For example, despite significant interest in electronic prescribing and medicines administration systems in NHS England, limited progress has been made with implementation. This is currently being tackled by an ePrescribing research programme funded by the National Institute of Health Research investigating the implementation, adoption and effectiveness of electronic prescribing and administration systems in hospitals in NHS England which will inform national guidance to support implementation. The programme recommends that trusts in NHS England sequentially work through the various stages in the recently developed ePrescribing toolkit. In addition, the use of multiple systems in some hospitals in NHS England may generate challenges for their safe use.

The strategic context of electronic prescribing and medicines administration in NHSScotland has been described at the beginning of this resource. The perceived quality benefits of electronic prescribing and medicines administration systems in NHSScotland have been identified and are described within the context of the strategic aims of the quality and eHealth strategies (see Section 3 below). Expert advice, in line with international experience, indicates that it is not possible, at present, to translate these into an economic benefit. However, it is crucial, at this relatively early stage in the evolution of electronic prescribing and medicines administration systems, to consider how progress will be monitored and evaluated to ensure the benefits are realised and unforeseen or unanticipated consequences are identified. Areas where NHSScotland wish to focus benefits realisation are identified (see Section 4 below).
2 The challenges in describing monetary benefits

Evaluating the impact of electronic prescribing and medicines administration systems is methodologically complex and existing published evidence on benefits is limited. In addition, direct cost-effectiveness evaluations are lacking. While there is clear evidence that electronic prescribing and medicines administration systems reduce the incidence of medication errors, there is a need to remain aware of the risks of new errors being introduced.\(^6,7\)

Interpreting the published evidence is challenging as findings may not necessarily be transferable to either NHSScotland or specific NHS boards as the contexts and electronic prescribing and medicines administration systems studied may not be commensurate to each NHS board. The reasons for this include the following.\(^6\)

- **Differing healthcare systems or settings**
  Most of the evidence is derived from the US which operates a different healthcare system to the UK. Additionally, the published evidence comes from various settings including primary and secondary care, inpatient and outpatients and various clinical specialty-based systems (for example medical, surgical, renal, paediatrics, intensive care).

- **Approach to, and stage of, implementation or maintenance and optimisation**
  Both the approach to implementation (for example ‘big bang’ or accelerated roll-out) and the stage of implementation or maintenance and optimisation will influence the impact of the electronic prescribing and medicines administration system.

- **Degree of customisation and idiosyncratic working practices**
  The systems studied vary from bespoke, commercially procured to customised commercial systems. Furthermore, idiosyncratic working practices will vary from ward to ward, specialty to specialty, and hospital to hospital which add to the complexity of interpretation.

- **Extent of integration with other clinical systems**
  The extent of integration with other clinical systems (for example laboratories, radiology, patient records) varies between studies.

- **Range and use of functionality**
  A range of system functionality, including clinical decision support, is used ranging from basic to advanced.
Translating the direct patient and broader strategic and quality benefits of hospital electronic prescribing and medicines administration systems is also a challenge. Firstly, the benefits of the electronic prescribing and medicines administration systems are most likely to be quality benefits (release time for care, avoid errors, improve communication, improve decision-making), achieving the quality ambitions of person-centredness, safety and efficiency. For example, NHSScotland experiences to date suggest that more medicines are administered on time as well as potential efficiencies in nurse time spent administering medicines which as a result would release more nurse time to care. This quality benefit is not easily translatable into financial savings, but significantly contributes to the person-centred quality agenda. Secondly, the benefits are not always gained by the healthcare professional using the electronic prescribing and medicines administration system or impact on that part of the healthcare system. For example, a longer time to electronically prescribe a medicine could result in a quicker, more efficient and smoother discharge with improved medicine reconciliation and information to primary care. This may create a benefit for a different hospital doctor or GP and not the original prescriber. These factors will contribute significantly to the patient safety and efficiency agenda. However, electronic prescribing and medicines administration systems reduce the incidence of medication errors and as medication errors are associated with significant morbidity and mortality, the resultant improvement in patient safety cannot be viewed as cost neutral. Finally, it may not be until the electronic prescribing and medicines administration system is interfaced with other electronic systems (for example laboratories and electronic patient record) and primary care that the biggest benefits are identified. Capturing the benefits of improved communication within this integrated framework has been estimated to take between 5 and 10 years to accrue.

Internationally there is, therefore, acceptance that costs cannot be readily ascribed to the benefits of electronic prescribing and medicines administration systems. However, it is reasonable to expect that monetary benefits could emerge from the strategic and quality benefits. The limited supportive data on benefits realisation presents a current challenge to both the development and outcome of NHS board business cases and national policy decisions.
3 Perceived benefits in NHSScotland

The commission reviewed the impact of electronic prescribing and medicines administration systems from three data sources – published literature, local NHS board evaluations and qualitative evidence on perceived benefits gathered throughout the commission. The benefits from these sources were aligned with the ambitions of the NHSScotland quality and eHealth strategies and are presented on pages 133-134. Individual benefits of electronic prescribing and medicines administration systems for key users have been described as follows.

- **Nurses** find their drug administration rounds easier due to ease of use, no chasing for missing paper prescription charts and legible, unambiguous prescriptions.

- **Clinicians** describe the system as being quick to use to prescribe with the advantage of never needing to re-write paper prescription charts. Pre-defined protocols can simplify and standardise prescribing and the immediate discharge letter, if used correctly, avoids the necessity to dictate, type and file additional follow-up letters to GPs on patient discharge which ensures timeous exchange of accurate and complete patient clinical information. The remote accessibility of current and historical prescribing is also advantageous.

- **Pharmacists** benefit from better pharmaceutical care planning, workload prioritisation, resource planning and facilitation of clinical checks of prescriptions on discharge.

While these potential benefits are achievable, expectations should be carefully managed ensuring the benefits of the new system are not initially over-sold.

Healthcare Improvement Scotland health economists reviewed the published literature and local NHS board evaluations to determine if existing evidence could be used in a cost-effectiveness evaluation. The lack of both published evidence generalisable to Scotland and usable data from local NHS board evaluations makes it difficult to conduct a cost-effectiveness analysis.
**Recommendations**

**Key messages**

1. **Benefits realisation**
   - "HEPMA is a key ingredient in making the process more patient-centred" (HEPMA, doctor).

2. Improved patient outcomes through (i) consistent and continuous care and (ii) enhanced patient safety by more efficient and safer prescribing and administration of medicines - "Right medication to the right patient at the right time at the right dose in the right form" (HEPMA, nurse).

3. Delivery of quality of care – timely access and communication of accurate and legible, current/historical prescribing and administration information.

4. Provides a foundation for medicines optimisation - facilitates communication at all points of patient transfer including admission discharge to ensure information accessible at point of need.

5. Potential through Immediate Discharge Letter (IDL) for accurate, complete, consistent, legible and timeous information to transfer to patient’s GP at point of discharge.

**Case studies**

**Person-centred**

- "Feels like it’s a safer prescribing system" (HEPMA, nurse) as "what we had wasn’t good" (HEPMA, doctor).

- Increased and real-time information available at time of prescribing including clinical information and current and previous medication.

- Avoids both multiple paper prescription charts for a single patient and re-writing with potential for associated transcription errors.

- Prescriptions are clear, legible and there is no ambiguity over drug names, doses, frequencies or administration times.

- Fewer missed doses.

- Prescribing and administration errors decreased but different types of errors generated. Potentially electronic prescribing and medicines administration systems could identify causes of errors which could feed into Scottish Patient Safety Programme.

**Safe**

- Instant access to drug information and clinical decision support (for example interactions, allergies).

- More robust audit trail of real-time clinical data and improved clinical accountability – no dubiety over who prescribed or administered medication; accessible data for handling complaints, incidents and competency issues.

- Enormous opportunity and capability for interrogating the electronic prescribing data and linkage with other available data at population level which may act as a lever for change and drive future improvements in healthcare provision – “data is our ultimate goal” and “we will reap the rewards later” (CEPAS, pharmacist).

- Use of community health index (CHI) number as a unique identifier.
### Effective

- Improved accessibility to live clinical information.
- Accessibility to both current and historical prescribing and administration data.
- Multi-site remote or off-site accessibility.
- Improved communication between disciplines.
- Continuity on transfer of patients – facilitates patient movement.
- Immediate discharge letter (IDL) – if used properly, more complete, legible, accurate, consistent and timeous information flows across interface (for example to GPs and other healthcare professionals). Satisfaction with discharge letter is greater at sites where IDL is used.
- Potential for ‘closing the loop’ on information flow between settings (for example with emergency care summaries, IDLs and medicines reconciliation).

### Efficient

- Working in a paperless prescribing and administration environment and moving towards electronic patient record.
- **Clinicians**: quick to prescribe and takes no more time than paper; remote prescribing; no re-writing paper charts; quick access to information; regimens and protocols can simplify prescribing and avoid mistakes; immediate discharge letter (IDL) avoids need to dictate, type and file additional follow-up letter on patient discharge - “no tail from ward round” (HEPMA, doctor); less calls from GPs post-discharge if IDL used.
- **Nursing**: ease of use; drug administration rounds easier and prompt; no chasing missing paper prescription charts; legible and unambiguous prescriptions.
- Impact on work practices with potential to standardise workflows – “redesign services using HEPMA to work smarter in a stretched service” (HEPMA, doctor).
- Potential to streamline medicines reconciliation in the future via better communication of clinical and prescribing information.
- Linking with stock control can improve medicines ordering and supply and links with financial reporting (for example of high cost items).
- **Pharmacy**: workload prioritisation based on risk; resource planning for dispensary, distribution and centralised intravenous additive service; better care planning; facilitates clinical check of prescription with fewer calls for clarification on discharge; access to prescribing data aids handling of medicines information queries; annotations as a "way of communicating clinical information" (CEPAS, pharmacist).
4 The future focus for benefits realisation in NHSScotland

The impact of electronic prescribing and medicines administration systems in NHSScotland needs to be assessed within the quality ambitions framework. It is reasonable to expect that financial benefits could emerge from the quality benefits. Benefits must be articulated in terms of:

- immediate safety and efficiency improvements following implementation of the electronic prescribing and medicines administration system (for example missed doses, clear prescriptions and reduced administration times)
- the richness and availability of secondary care electronic prescribing and administration data to improve the safe and effective use of medicines, clinical practice, clinical research and patient safety
- how the electronic prescribing and medicines administration system supports the delivery of the quality ambitions of safe, effective and person-centred care
- the delivery of the overall eHealth visions of a ‘whole system approach’ in which there is a single, shared medication record which moves with the patient and is kept up to date by the current prescriber, and
- other national strategic priorities such as the Scottish Patient Safety Programme (Medicines Reconciliation and High Risk Medicines), Releasing Time To Care, Health and Social Care Integration and Prescription for Excellence.

For example, creating a complete medication prescribing and administration record for an individual patient containing up-to-date historical and current prescribing and clinical information (including allergies and adverse drug reactions and interactions) which would be instantaneously accessible to a range of healthcare professionals is without doubt a key step to delivering person-centred, safe and efficient care and electronic prescribing and medicines administration is pivotal in achieving this.
5 Conclusions

NHSScotland experience to date indicates that electronic prescribing and medicines administration systems provide an important foundation for improving the safe and effective use of medicines thereby providing an opportunity to enhance patient safety in both acute and primary care settings. However, there is as yet relatively limited published evidence on the benefits of electronic prescribing and medicines administration in improving outcomes for patients. In addition, evaluating the impact of electronic prescribing and medicines administration systems is complex and internationally there is agreement that costs cannot at present be readily ascribed to the benefits.

NHSScotland supports the approach to benefits realisation that is focused on the broader strategic and quality benefits of electronic prescribing and medicines administration systems linked to NHSScotland policy and strategy. It is expected that this will accrue financial benefits. The commission has provided clarity on the current evidence and expert opinion on benefits realisation.

Considering how progress with implementation will be monitored and evaluated to ensure the benefits are realised and unforeseen or unanticipated consequences are identified is recommended. This will help inform decision-making not only in local NHS boards and across NHSScotland, but also internationally.
6 References


<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
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<td>Appendix 6</td>
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<td>Appendix 7</td>
<td>References</td>
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</tbody>
</table>
Appendix 1: Membership and roles and responsibilities of project board, reference group and academic advisers

Commission project board

The project board was responsible for the overall governance of the commission and was accountable to the safer medicines working group, a sub-group of the eHealth strategy board.

Membership of the project board included:

- representatives from the safer medicines working group
- medical, nursing, pharmacy and eHealth representatives from commissioned organisations and other NHS boards across Scotland
- Scottish Government procurement and financial advisers, and
- commission lead and clinical adviser from Healthcare Improvement Scotland.
Project board membership

Cliff Barthram  Consultant Anaesthetist and joint eHealth lead, NHS Tayside
Jill Booth  Clinical Adviser to the commission, Healthcare Improvement Scotland
Gail Caldwell  Pharmacy Director, NHS Forth Valley (co-chair)
Michele Caldwell  Director of Pharmacy, NHS Ayrshire & Arran
David Coulson  Head of Medicines Governance, NHS Tayside (from 11 November 2013)
June Delaney  Senior Charge Nurse, NHS Lanarkshire
Douglas Griffin  Scottish Government Advisor, Scottish Government
Barry McAlister  Head of Systems, NHS Lanarkshire
Laura McIver  Chief Pharmacist, Healthcare Improvement Scotland (co-chair and commission lead)
Ewan Morrison  Associate Director of Pharmacy - Acute Services, NHS Lothian
Mark Salveta  Head of Business Advisory Group, NHS National Services Scotland

The work was supported by the commission team at Healthcare Improvement Scotland.
Commission reference group

The reference group had membership from the commission’s consortium of NHS boards. The reference group:

- acted as a support to the commission team in their delivery of the commission tasks and objectives
- was the key communication conduit between the commission team and consortium boards and membership was limited to the consortium NHS boards’ primary contacts
- acted as gatekeepers within their consortium NHS boards to enable the commission team to undertake interviews and focus groups with participants and access evidence from local evaluations and
- participated in discussions and reviewed commission outputs to determine their practicality and utility, seeking broader advice from colleagues when required.

The reference group was accountable to the commission’s project board.

Membership of the reference group included:

- representatives from the commission’s consortium NHS boards, and
- commission lead and clinical adviser from Healthcare Improvement Scotland.
Reference group membership

Jill Booth  Clinical Adviser to the commission, Healthcare Improvement Scotland (chair)
Michele Caldwell  Director of Pharmacy, NHS Ayrshire & Arran
Christine Gilmour  Chief Pharmacist, NHS Lanarkshire
Kate MacDonald  Network Manager, South East Scotland Cancer Network (SCAN)
Mary Maclean  Regional Cancer Care Pharmacist (West of Scotland), NHS Greater Glasgow and Clyde
Laura McIver  Chief Pharmacist, Healthcare Improvement Scotland (commission lead)
John Milne  Lead Pharmacist - Oncology Services, NHS Lanarkshire
Ewan Morrison  Associate Director of Pharmacy - Acute Services, NHS Lothian
Mark Parsons  Macmillan Regional Cancer Pharmacist - North of Scotland, NHS Tayside

The work was supported by the commission team at Healthcare Improvement Scotland.
# Commission academic advisers

The commission had two academic advisers who provided external expert advice. They reviewed and shaped the commission outputs and provided linkage to national and international intelligence and colleagues.

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Marion Bennie</td>
<td>Professor of Pharmacy Practice, University of Strathclyde, Glasgow</td>
</tr>
<tr>
<td>Aziz Sheikh</td>
<td>Professor of Primary Care Research and Development and Co-Director, Centre for Population Health Sciences, The University of Edinburgh</td>
</tr>
</tbody>
</table>
Appendix 2: Methodology

Design

A qualitative methodological approach was selected. This methodology was the best fit for the commission objectives which focused on identifying the perceptions and experiences of healthcare professionals using or implementing primarily Hospital Electronic Prescribing and Medicines Administration (HEPMA) systems, and also Chemotherapy Electronic Prescribing and Administration Systems (CEPAS) within NHSScotland.

Individual interviews, dyadic interviews and focus groups were conducted with a variety of healthcare professionals using a rigorous methodological approach. Initially, it was anticipated that most of the participants would contribute through attending focus groups but gatekeepers in each of the five consortium NHS boards areas indicated that some disciplines might not be able to commit to a two-hour focus group and instead a 1:1 interview would be more suitable. Some gatekeepers also suggested combinations of participants who could be interviewed as a dyad. Consequently to interview as many participants as possible over a limited timescale, a combination of the three approaches was used. The choice of which of the three methods was tailored to individual participants and was based on:

- availability and accessibility of participants
- time available with participants
- the attempt to minimise the level of intrusion for participants, or
- the most efficient and pragmatic arrangement to recruit, collect and concurrently analysis data over a large geographical area within a short timescale.
Sampling and recruitment

A purposive sampling technique was used to select participants from the consortium NHS boards working with Healthcare Improvement Scotland on the commission - NHS Lanarkshire, NHS Ayrshire & Arran and the three cancer networks. The aim was to seek the perceptions and experiences of both HEPMA and CEPAS users and implementation teams to identify best practices and lessons learned. Other NHS board contacts were identified to determine their expectations of a lessons learned resource and also to explore their perceptions on the potential to use the increased prescribing data which will become accessible. These included executive/strategic contacts and pharmacists involved with clinical effectiveness and pharmaco-epidemiology. Each of the consortium boards had a representative on the commission’s reference group. These individuals acted as gatekeepers and identified potential participants in each of their individual areas. The gatekeeper in each NHS board area, together with the clinical adviser, then prioritised the identified participants using a purposive sampling strategy to ensure maximum variation of representatives within the sample:

- from medical, nursing, pharmacy, eHealth and executive backgrounds
- with differing levels of seniority within each healthcare discipline
- who were either users of HEPMA/CEPAS systems or from the HEPMA/CEPAS implementation team or both, and
- with differing viewpoints and opinions, positive or negative.

All identified contacts were sent an email by the gatekeeper in their individual areas introducing the commission, inviting participation and highlighting that the commission team might approach them. The prioritised contacts were then approached via email by the commission team explaining the background to the commission, inviting them to participate and explaining what participation would involve. Those responding positively were assigned to either an individual interview, dyadic interview or focus group as outlined above. Participants also identified other potential contacts who were not included on the original list for interviewing (for example advanced nurse practitioners, dispensary pharmacists, junior doctors). These individuals were included where possible. The reference group and project board believed there were no identified gaps in the disciplines or grades interviewed. After the interview or focus group, an email was distributed thanking participants and outlining the commission team’s contact details should there be any additional issues they wished to raise. An email of thanks was also distributed to potential participants identified by the gatekeeper but not contacted by the commission team.

Inclusion/exclusion criteria – participants were able to be released from their duties to participate in a pre-arranged interview or focus group. No other exclusion criteria applied.
Data collection

All interviews and focus groups were conducted by the clinical adviser, with the programme manager assisting in the latter, over a four-month period between March–June 2013. These took place at a time and place convenient for participants and maintaining confidentiality. Interviews lasted 15-60 minutes and focus groups lasted 1.5-2 hours. As far as possible, interviews were conducted face to face, but where this was not feasible telephone interviews were undertaken.

An interview topic guide was used to conduct the semi-structured in-depth interviews and focus groups. Interviews and focus groups began with the clinical adviser introducing herself (and the programme manager if present), inviting participants to introduce themselves, and thanking interviewees for participating. It was then outlined what would be discussed during the interview or focus group and how the discussion would be documented. Reassurance was also provided on confidentiality and anonymity.

Although five key topics were of overall interest, topics were selected to suit participants as not all were relevant to an individual participant’s professional role (nursing, medical, pharmacy or eHealth). For this reason, saturation was not achieved until the later weeks of data collection. Participants were notified via email of the topics to be discussed in advance of their interview or focus group. Themes within each of these topic areas were identified within the topic guide with suggested key open-ended questions to elicit the necessary detail. Where insufficient detail was generated using these key questions, prompts and probes were used to encourage elaboration. The discussion was informal with the clinical adviser incorporating the interviewee or groups’ words and adapting the question order to achieve a spontaneity of conversation. The choice and phrasing of questions were designed to establish lessons learned and best practices from participants’ experiences with HEPMA or CEPAS.

Interviews were recorded using contemporaneous notes and transcribed using Microsoft Word as soon as possible after the interview or focus group by the clinical adviser. Responses were confidential and to maintain anonymity each interview or focus group and its subsequent transcript were given a unique numerical identifier. Participants were not identifiable from any quotations used to illustrate the interpretations of their experiences.
Analysis

The clinical adviser undertook the coding and analysis manually using the framework approach to thematic analysis. This approach allowed the clinical adviser to remain close to the data and provided an overview of the data. Analysis was ongoing, occurring concurrently with data collection, to allow any new, emerging themes to be incorporated into subsequent interviews and focus groups. The clinical adviser developed a coding scheme, applied the codes to the data and, with the programme manager, arranged the coded segments of text in the framework matrix by themes. The clinical adviser then interpreted themes by exploring relationships and identifying differing cases. The programme manager cross-checked the clinical adviser’s coding decisions and validated interpretations which added rigour to the analysis. The frameworks used for thematic analysis were subject to strict version control and regular back-up.

While the focus groups provided a general overview of the key issues, the interviews provided a much broader and deeper insight into individual participant perceptions and experiences which enriched the overall analysis. In addition, as the analysis was iterative, topics identified in focus groups were further explored in future interviews.

Recommendations for a safe and successful implementation were generated by triangulating the qualitative evidence, findings of the lessons learned literature review undertaken by Healthcare Improvement Scotland knowledge services unit and local evaluations from NHS boards and cancer networks. The recommendations include a self-assessment checklist and action planning tool. The recommendations were peer reviewed by the commission’s reference group and individual members of the project board.
Complementary work

A checklist was prepared to help NHS boards self-assess their state of readiness to implement electronic prescribing and medicines administration systems.

Five case studies were prepared with NHS Ayrshire & Arran, NHS Dumfries & Galloway, NHS Highland, NHS Grampian and NHS Lanarkshire. The case studies illustrate different NHS board approaches and experiences to business planning and/or implementing electronic prescribing and medicines administration systems in NHSScotland.

An exploration of the benefits realisation of hospital electronic prescribing and medicines administration systems was undertaken as part of the commission. Input was provided by the commission’s academic advisers, Healthcare Improvement Scotland’s health economists and the safer medicines working group.

The commission team worked with Healthcare Improvement Scotland’s communications team to design and host the final resource.

Reflexivity

The clinical adviser who designed the interview topic guide, conducted interviews and focus groups, coded the interview and focus group transcripts and undertook the analysis was a pharmacist. As the clinical adviser’s own professional views may, therefore, have influenced the interpretation of participants’ experiences, views and perceptions, every attempt was made to produce an authentic, credible account illustrated by anonymised participant quotations. In addition, the programme manager verified the clinical adviser’s coding and interpretations. This strengthens the analysis.
Appendix 3: Participant demographics

Over a four-month period, March-June 2013, multidisciplinary interviews and focus groups were conducted with 87 participants to identify lessons learned and best practices on the Hospital Electronic Prescribing and Medicines Administration (HEPMA) system implementations in NHS Ayrshire & Arran and NHS Lanarkshire (n=57). In addition, generic learning was compiled from the experience of Chemotherapy Electronic Prescribing and Administration Systems (CEPAS) implementations within the three NHSScotland cancer networks (n=26). Other NHS board contacts from within Scotland, including management, executive and strategic roles, were also included (n=4).

Of the 87 participants, 42 participated in a 1:1 interview (48%), 12 in a 1:2 interview (14%) and 33 in focus groups (38%). The demographics of the 57 HEPMA, 26 CEPAS and four executive contacts are presented below.

**HEPMA**

The areas of work for the 57 HEPMA participants were:

<table>
<thead>
<tr>
<th>Area</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>NHS Ayrshire &amp; Arran</td>
<td>42 (74%)</td>
</tr>
<tr>
<td>NHS Lanarkshire</td>
<td>10 (18%)</td>
</tr>
<tr>
<td>Other NHS board areas*</td>
<td>5 (8%)</td>
</tr>
</tbody>
</table>

*Other NHS board areas included NHS Dumfries & Galloway (n=1), NHS Grampian (n=1), NHS Greater Glasgow and Clyde (n=2) and NHS Highland (n=1).

The disciplines of the 57 HEPMA participants were:

<table>
<thead>
<tr>
<th>Discipline</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>eHealth</td>
<td>7 (12%)</td>
</tr>
<tr>
<td>Medical</td>
<td>8 (14%)</td>
</tr>
<tr>
<td>Nursing</td>
<td>13 (23%)</td>
</tr>
<tr>
<td>Pharmacy</td>
<td>29 (51%)</td>
</tr>
</tbody>
</table>
CEPAS

The areas of work of the 26 CEPAS participants were:

- NoSCAN: 6 (23%)
- SCAN: 9 (35%)
- WoSCAN: 11 (42%)

The disciplines of the 26 CEPAS participants were:

- eHealth: 3 (11%)
- Management: 2 (7%)
- Medical: 4 (15%)
- Nursing: 4 (15%)
- Pharmacy: 13 (52%)

Executive

Of the four executive contacts, three worked in NHS Greater Glasgow and Clyde (75%) and one in NHS Tayside (25%). The four executive contacts were a chief executive, director of eHealth, clinical eHealth lead and a director of pharmacy in an NHS board which does not currently use an electronic prescribing and medicines administration system.
High level standards for electronic prescribing and medicines administration applications in Scotland were developed as part of the Scottish strategy for pharmaceutical care *The Right Medicine*. These standards have been used to develop national operational requirements for electronic prescribing and administration systems with associated test scripts and success criteria.¹

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>Electronic prescribing and medicines administration systems used for the prescription and administration of medicines in NHSScotland must be tested against the national operational requirements and associated test scripts and must meet the required safety requirements associated with moving from a paper based to an electronic system.¹</td>
</tr>
<tr>
<td>2</td>
<td>Electronic systems used for the prescription and administration of medicines:</td>
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<tr>
<td></td>
<td>• conform to legislative requirements, national guidance and best practice which is reflective of UK systems and standards</td>
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<td></td>
<td>• maintain patient confidentiality and meet the requirements of Caldicott</td>
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<td></td>
<td>• accommodate all categories of prescriber</td>
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<td></td>
<td>• incorporate a field for a UK unique product identifier as required by the Scottish Government</td>
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<tr>
<td></td>
<td>• operate using a single drug dictionary within each and across each NHS organisation and must include the ability to link with systems used within the independent sector</td>
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<tr>
<td></td>
<td>• use the CHI as the prime patient identifier and are able to handle multiple hospital numbers and multiple episodes of care</td>
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<tr>
<td></td>
<td>• use clinical decision support tools provided by a source which reflects UK practice and which are validated and approved for this purpose</td>
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<tr>
<td></td>
<td>• facilitate the cost effective use of medicines through the use of local formulary management systems</td>
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<td></td>
<td>• facilitate the use and re-supply of patients’ own medicines and self-administration by patients</td>
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<tr>
<td></td>
<td>• handle all types of patients and movements that can occur during the inpatient stay and at all points of transfer (including admission and discharge) and must carry out all associated medication transactions in a clear and unambiguous manner</td>
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<td></td>
<td>• support pharmaceutical care in accordance with recognised best practice</td>
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<td></td>
<td>• include arrangements for professional and technical support available on a 24/7 basis. Other important aspects of an ‘always on’ service are reliable networks and hardware devices, and</td>
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<td></td>
<td>• integrate fully with other related systems including the patient administration system(s), results reporting systems, integrated care pathways, reporting tools and primary care systems using recognised NHSScotland systems integration and other standards.</td>
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<tr>
<td>3</td>
<td>Suppliers of electronic systems used for the prescription and administration of medicines:</td>
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<td></td>
<td>• demonstrate a systematic approach to quality assurance of the system being supported, and</td>
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<td></td>
<td>• report all adverse incidents involving the correct use of the electronic prescribing and administration system to all users.</td>
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</table>


For information on the PMS Output Based Specification, please contact Mark Salveta, Head of the Business Advisory Group, National Information Systems Group, NHS National Services Scotland (mark.salveta@nhs.net).
Appendix 5: Checklist to assess state of readiness to implement

A self-assessment checklist and action planning tool are included for each of the three areas identified as being critical to a safe and successful implementation of an electronic prescribing and medicines administration system.

These three areas are:

1. Governance and risk management
2. Leadership and organisational change
3. Technology

The self-assessment checklists and action planning tools may be useful to help NHS boards to self-assess their state of readiness to implement electronic prescribing and medicines administration systems. They are best completed after consideration of the supportive detail which underpin the recommendations as they complement each other and are designed to be used together.

For convenience and ease of use, the separate checklists have been replicated here as one complete checklist and action planning tool.
### Governance and risk management

#### Self-assessment

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Action</th>
<th>Priority? yes/no</th>
<th>Who will action?</th>
<th>When by?</th>
<th>Review date</th>
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</thead>
<tbody>
<tr>
<td>Is support from the NHS board’s director of pharmacy (DoP) and area drug and therapeutics committee (ADTC) secured?</td>
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<tr>
<td>Do the DoP and ADTC acknowledge their medicines governance roles in supporting the safe and successful implementation, maintenance and optimisation of electronic prescribing and medicines administration systems?</td>
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<td>Are formal risk management procedures in place?</td>
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<td>Have the potential risks associated with operating a dual (paper and electronic) system been identified and mitigated?</td>
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<tr>
<td>Have the new types of potential risks to patient safety when the electronic prescribing and medicines administration system is introduced been identified and mitigated?</td>
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<td>Has the ADTC validated clinical decision support functionality decisions?</td>
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<td>Has the ADTC sanctioned prescribing protocols?</td>
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<td>Is good document management in place?</td>
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<td>Are supportive documents up to date and accessible for all users?</td>
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</table>
## Leadership and organisational change

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<tr>
<th>Criteria</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Action</th>
<th>Priority? (yes/no)</th>
<th>Who will action?</th>
<th>When by?</th>
<th>Review date</th>
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</thead>
<tbody>
<tr>
<td>Is there organisation-wide support for the project with strong leadership and ownership from nursing, medical and pharmacy teams?</td>
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<td>Has a formal project plan been devised to ensure a safe and successful implementation?</td>
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<td>Is there a project board, comprising wide stakeholder representation with decision-making capability, to ensure a strongly governed and well executed project?</td>
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<td>Have representatives from key disciplines and users been identified to form the project implementation team?</td>
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<td>Is there an identified pharmacy project lead capable of driving the project in all professional spheres?</td>
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<td>Have approaches to manage the behavioural change accompanying the new system been identified?</td>
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<td>Is there an agreed communication plan to support the project and ensure staff are well informed, engaged and involved?</td>
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<td>Have 24/7/365 support arrangements, for both implementation and ongoing, been agreed as appropriate?</td>
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<tr>
<td>Criteria</td>
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<td>No</td>
<td>N/A</td>
<td>Action</td>
<td>Priority? yes/no</td>
<td>Who will action?</td>
<td>When</td>
<td>Review date</td>
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<tr>
<td>Has organisational agreement and commitment to the training plan been acquired?</td>
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<td>Have all healthcare professionals (and all grades) required to use the electronic prescribing and medicines administration system been identified for training?</td>
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<td>Has a training plan been developed?</td>
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<tr>
<td>Have (i) who requires training, (ii) when training will be delivered and (iii) how training will be delivered been considered?</td>
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<tr>
<td>Have training materials been developed?</td>
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<td>Has a suitable training environment been identified which relates the training to the workplace?</td>
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<td>If training is to be delivered in a classroom environment is there an opportunity for trainees to spend time working hands-on with test scenarios?</td>
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<td>Is there a plan for ongoing training (for example of new staff, locums, bank staff and on upgrades)?</td>
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<td>Have potential risks associated with training been identified and mitigated?</td>
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<td>Has an escalation route been agreed should resistance or non-attendance at training be detected?</td>
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## Technology

### Self-assessment

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<th>Criteria</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
<th>Action</th>
<th>Priority? yes/no</th>
<th>Who will action?</th>
<th>When by?</th>
<th>Review date</th>
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<tr>
<td>Have equipment requirements been determined to ensure adequate availability and accessibility for users on wards?</td>
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<td>Has a process been established to report software performance issues?</td>
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<td>Is there a plan for a scalable and sustainable deployment of the system?</td>
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<td>Is investment in the local network required to ensure the infrastructure can reliably support the application?</td>
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<td>Has a suitable test plan been developed and agreed covering full end-to-end performance testing in advance of go live?</td>
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<td>Has determining, approving and setting up user access right been agreed in advance with each user having a unique username and password?</td>
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<td>Are security arrangements in place in accordance with local policy (for example anti-virus software and firewalls)?</td>
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<td>Is the electronic prescribing and medicines administration system being viewed as a priority in hospital business continuity plans to prevent service disruption?</td>
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</table>
Appendix 6: Acknowledgements

The following 87 individuals participated in interviews and focus groups to share their views and experiences of electronic prescribing and medicines administration systems:

Ewan Alexander  Application Support, NHS Ayrshire & Arran
Mark Barber  Consultant - Care of the Elderly, NHS Lanarkshire
Cliff Barthram  Consultant Anaesthetist and Joint eHealth Clinical Lead, NHS Tayside
Carolyn Bedi  Consultant Clinical Oncologist, NHS Lothian
Karen Borthwick  Senior Pharmacy Technician, NHS Ayrshire & Arran
Mike Boyle  Clinical Nurse Manager, NHS Ayrshire & Arran
Kathryn Brechin  Clinical Nurse Manager, NHS Lothian
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Angela Caddell  Senior Charge Nurse, NHS Lanarkshire
Carrie Cahill  Ward Sister, NHS Ayrshire & Arran
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Carla Forte  Lead Clinical Pharmacist Cancer Services - North Glasgow, NHS Greater Glasgow and Clyde
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Andy Grayer  Head of Infrastructure Service, NHS Ayrshire & Arran
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Andy Hardy  Head of eHealth Systems and Development, NHS Ayrshire & Arran
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Stewart Hunter  Associate eHealth Director, NHS Tayside
Allison Inglis  Senior Charge Nurse, NHS Tayside
Gillian Jardine  Lead Pharmacist, NHS Ayrshire & Arran
Everett Julyan  Consultant Psychiatrist, NHS Ayrshire & Arran
Norman Lannigan  Lead Pharmacist - Acute Services, NHS Greater Glasgow and Clyde
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David MacDonald  Pharmacy and Prescribing System Manager, NHS Ayrshire & Arran
Kate MacDonald  SCAN Network Manager, NHS Lothian
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<tr>
<th>Name</th>
<th>Position and Affiliation</th>
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<td>Barry McAlister</td>
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<td>David McGill</td>
<td>Senior Charge Nurse, NHS Ayrshire &amp; Arran</td>
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<td>Project Manager, NHS Lanarkshire</td>
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<td>Tracey McMahon</td>
<td>Senior Charge Nurse, NHS Ayrshire &amp; Arran</td>
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<tr>
<td>Morag McNulty</td>
<td>Charge Nurse – Medical, NHS Ayrshire &amp; Arran</td>
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<td>John Milne</td>
<td>Lead Pharmacist - Oncology Services, NHS Lanarkshire</td>
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<tr>
<td>Gayle Munro</td>
<td>Specialist Pharmacist - Oncology/Haematology, NHS Tayside</td>
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<td>Ria Parks</td>
<td>Pharmacy Technician, NHS Ayrshire &amp; Arran</td>
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<td>MacMillan Regional Cancer Pharmacist, NHS Tayside</td>
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<td>Chief Pharmacist, NHS Dumfries &amp; Galloway</td>
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<td>FYI, NHS Ayrshire &amp; Arran</td>
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<td>Pharmacy Technician, NHS Ayrshire &amp; Arran</td>
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France Yuille  Consultant Clinical Oncologist, NHS Lothian
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<td>Chancellor’s Fellow, The School of Health in Social Science, The University of Edinburgh</td>
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<td>Lesly Donovan</td>
<td>eHealth Management Support, NHSScotland</td>
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<td>Eunice E Muir</td>
<td>eHealth Clinical Lead (NMAHP’s) and member of Safer Medicines Working Group, Scottish Government</td>
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<td>Director of Pharmacy, NHS Fife</td>
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<td>Rose Marie Parr</td>
<td>Director of Pharmacy, NHS Education for Scotland</td>
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<td>Business Development Manager, JAC Computer Services Limited</td>
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<td>eHealth Lead and Chair of Safer Medicines Working Group, Scottish Government</td>
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<tr>
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<td>Assistant Director of Pharmacy, NHS Education for Scotland</td>
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<td>Neil Watson</td>
<td>Clinical Director of Pharmacy and Medicines Management, Newcastle Upon Tyne Hospitals NHS Foundation Trust</td>
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Appendix 7: References

This is a complete list of references which were used to inform the work of the commission. Some have been referenced in other sections of the resource where applicable.


The Healthcare Environment Inspectorate, the Scottish Health Council, the Scottish Health Technologies Group and the Scottish Intercollegiate Guidelines Network (SIGN) are part of our organisation.

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