

A win-win situation: How optimising medication management technology delivers for patients, taxpayers, and the UK healthcare system



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Foreword

Automation in UK hospital pharmacy departments is not new. Deployment of dispensing robots began in the 1990s and today it is unusual not to see one in a dispensary. Pharmacy departments and the NHS have benefitted from a more efficient and safer way of working, and staff have been freed up to carry out other tasks. Pharmacy automation at hospital ward level, which stores medication and supports nursing staff to provide a more efficient and safer medicines administration service to patients, is increasing but is less common. Where it is deployed and implemented well, it can free up nursing staff to provide other patient care activity while potentially improving patient safety through fewer medication errors.

In recent years, the NHS has made substantial investments in electronic prescribing systems, helping to increase their prevalence in hospitals and bringing notable patient safety benefits. With the establishment of standardised and mandated medication standards for digital systems, the foundations are now in place to reimagine how connected digital medicines management can support improvements in patient care and significantly enhance efficiency. The digital integration of prescribing with medicines administration and supply can help transform the health system, creating a powerful new tool that equips the service with new capabilities to identify inefficiencies and drive change. This cannot only liberate staff and enhance safety, but also revolutionise processes related to medicines utilisation, stockholding, storage and procurement.

Hospital chief pharmacists have done their best to secure the funds and commitment locally to deploy medicines management technology, but have had variable success. They are often a lone voice trying to persuade senior managers to prioritise the necessary investment. With the NHS drugs bill now approaching £20 billion a year, and the NHS looking to free up staff while increasing safety and productivity, it is now time to draw in senior managers and policy makers to develop a more strategic, joined up approach to the deployment and connection of medicines management technology. This won't be an easy task. There remain some gaps in the evidence base for the effectiveness of the technology. Digitally connecting typically disparate prescribing, medicines administration and dispensing systems is not without its challenges. But when these barriers are overcome, supported by a national focus on this technology, then the benefits for patients, taxpayers and the NHS will be considerable.

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System transformation – looking to the future

Optimising both medicines use and patient outcomes requires effective medicines management to support safe and efficient care of patients and to manage the NHS's biggest area of spending, after staff. Effective medicines management is complex, involves many processes and occupies a lot of professional staff time. Digitally connecting and automating these processes through what we call "Connected Medication Management (CMM)" enables health systems to tackle demographic and structural challenges more effectively, drive efficiencies, free up significant numbers of staff, and deliver better and safer care for patients. BD's record of being a partner in health service change and transformation is long-standing and is rooted in our work helping the NHS to automate pharmacy services in both secondary care and the community.

While there has been some progress in deploying CMM technology, it has been largely piecemeal and locally driven. We believe now is the time to grasp the opportunity, build on local initiatives, and take a nationally driven strategic approach. Taking this action will help us to improve patient outcomes, support the workforce and make the best use of scarce NHS resources. We are keen to work in partnership with NHS leaders and pharmacy, clinical, nursing and finance professionals to advance the development of national and local policy and practice that brings about real, coordinated change.

We hope our vision will prompt new conversations and thinking across the system and we look forward to discussing our thoughts with NHS colleagues to accelerate transformation in medicines management.

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Executive summary

There is a significant opportunity for improvement and transformation in the UK health system to address the current slow and piecemeal approach to the adoption of innovative medicines management technology. Connected Medication Management (CMM) technology has the potential to transform every step of the medicines pathway, from supply through to the patient bedside – it can help create a safer, smarter, and more efficient health system.

While there is some adoption of this technology across the UK, its full potential to tackle the UK health system's biggest challenges is not widely understood and as such, it not been an area of focus for national policy and decision makers in government and the NHS. The aim of this Policy Vision is to discuss the benefits of CMM technology and bring to life how strategic deployment can deliver for patients, taxpayers, and the UK health system.

Relieve workforce pressures by releasing time for high-value tasks

The NHS is in the midst of a workforce crisis, with a shortage of workers across almost every healthcare profession¹.

CMM can release health professionals from conducting mundane and time-consuming tasks related to the management of medicines and enable them to spend more time delivering high-value patient-facing services². The technology can support pharmacists and nurses in working at the top of their licence, helping to relieve the burden on the workforce and support the delivery of high-quality patient centric services.

Drive financial savings through smart management of medicines

Medicines account for the second highest spend in the NHS, with only the workforce having a higher budget³. The NHS spends approximately £17.2bn on medicines a year, and this figure is expected to continue to rise in the coming years⁴. Managing the growth of the medicines bill is a priority for the service and CMM can support this aim by delivering a smarter, more sophisticated and connected system for the management of medicines.

The NHS has some of the most complete health data in the world⁵. The service is in the almost unique position of being able to aggregate and analyse the data relating to millions of patients, which, if fully utilised, has the potential to transform care in the NHS. CMM can support this data revolution, helping to connect disparate parts of the service together, enriching the quantity and quality of available data and empowering the NHS to reduce the cost of delivering care and improve patient outcomes.

By digitising and connecting the management of medicines across a hospital and system, CMM can enable a much greater level of visibility on medicines inventory. This can help to reduce medicines wastage, which is estimated to cost the NHS over £300m per annum⁶. It can also help the NHS better manage demand profiles for medicines, allowing it to have a better view of stock levels across an area and enabling it to move medicines between service providers as and when they are needed.

CMM can also support a transformation in procurement, by helping better manage the supply and distribution of medicines. By connecting with suppliers of medicines in a more sophisticated way, the NHS can streamline its ordering of stock, ensuring the orders flow when they are needed, and they have the right amount of stock in the right location. Greater transparency of the medicines use and inventory data across NHS systems and improved collaboration could lead to new initiatives and commercial arrangements with suppliers, as well as helping policymakers at national level in pricing discussions with the pharmaceutical industry.

Build a safer health system by reducing prevalence of medication errors

Medication errors are the number one cause of avoidable harm in the NHS, with an estimated 237 million medication errors occurring in the NHS each year⁷. The estimated cost to the NHS of definitively avoidable adverse reactions to medication is £98.5million a year, approximately 3% of the total NHS budget⁸.

While there has been good progress in recent years in putting in place the cultural, procedural, and regulatory changes intended to minimise the scope for human error, the prevalence of patient safety incidents continues to be a major challenge for the service, with data showing that NHS staff report approximately 184,000 patient safety incidents per month⁹.

There is an opportunity for a new wave of patient safety reform, where CMM technology can help digitise and automate the medicines journey, delivering the safer and more secure handling of medicines through the diffusion of new tools, solutions and technology that can transform the management of medicines.

Impact of Connected Medication Management on the system

As CMM is more widely adopted there will be greater understanding of the full benefits. Based on the evidence currently available and the visible impact of the technology on NHS services today, it is possible that the following efficiencies and savings could be achieved through more widespread adoption of CMM technology:

1. Enable hospital pharmacy professionals to spend 30% more time on direct patient care, the equivalent to an additional 961 FTE hospital pharmacists across the NHS workforce a year^{10,11,12,13}.
2. Reduce the time spent by nurses on medicine related tasks by 33%, the equivalent of 1,735 additional full-time nurses across the workforce a year^{14,15,16}.
3. Save £41m a year by reducing medicines wastage in hospitals^{17,18}.
4. Reduce medication errors associated with medicines administration by 53%, the equivalent of 13.8m a year^{19,20}.

Call to action

The government and NHS should convene experts from across the UK to undertake a targeted review of medicines management in hospitals, to identify the opportunities available through the greater use of digital technology and automation. This should be accompanied by an action plan for the implementation of a new vision for the future, including how CMM can transform care in the acute sector and its potential to join up and reform the management of medicines across the whole system.

Ahead of that review, there are several areas where action is needed to deliver change now:

- The National Institute of Health and Care Research (NIHR) should fund evaluations of the impact of CMM on medicines wastage, medicines diversion, staff utilisation and deployment, and the true extent of medication errors to demonstrate the case of improvement and to establish a benchmark against which progress can be measured.
- NHS England should invest in education and training to ensure pharmacy and nursing professionals have the skills and expertise to maximise the benefits of CMM.
- NHS England should develop a clear national framework to support investment in CMM and greater, coordinated uptake of digital technology to spread innovation at pace and scale.
- Following the existing commitment to Electronic Patient Record roll out, an explicit policy and system goal should be set for rolling out CMM across the acute sector.
- Provision should be made nationally in budgets for frontline digitisation to support NHS trusts through matched funding for such initiatives.
- Assessments of the digital maturity of trusts and systems should be updated to reflect the untapped potential of CMM as a digitisation programme.

As a major supplier of CMM technology to the NHS, BD is committed and stands ready to work in partnership with stakeholders from across the system, as we seek to support the NHS in meeting the challenges of today and paving the way for the next 75 years of supporting health and wellbeing in the UK.

Introduction

The NHS spends £17.2bn a year on medicines, a figure which is expected to grow in parallel with the UK's ageing and growing society²¹. Medicines are a major contributor to patient care and the NHS is committed to optimising their use and improving patient outcomes. Connected Medication Management (CMM) could support that aim and reap benefits right across the health system, including in primary, secondary and social care, as well as in the distribution and supply of medicines.

CMM technology offers potential benefits throughout the UK health system, including the devolved nations. However, the main focus of proposals set out in this paper is on those changes that can be delivered within the acute hospital sector.

What is Connected Medication Management Technology?

CMM is a combination of automation, digital and software technology creating a connected ecosystem that can be utilised throughout the medicine journey, from receiving the stock in the pharmacy to administering the medicine to the patient.

CMM encompasses a range of technologies, from robots that can store, pick, and prepare medicines in pharmacies, to automated workflow systems that supply, dispense, and facilitate smart administration of medicines by nurses at ward level.

How does CMM technology work?

- Software manages inventory placing automatic orders based on prescribing, avoiding stock outs, and ensuring medicines are used in a timely and safe way. Stock levels both in the pharmacy and on wards are monitored and optimised avoiding wastage and helping to drive efficient procurement.
- In the hospital pharmacy, automated technologies are used to store, dispense, compound and label medicines assigning unique barcodes that allow tracking of a medicine as it makes its journey through the hospital.
- On a ward, secure, automated dispensing, and storage devices, linked to e-prescribing and the electronic patient record and administration system, are used to guide nurses to the medicines a patient is prescribed.
- Traceability and reporting of dispensing activity combined with administration data of high-risk, critical infused medicines via WiFi-enabled infusion pumps, optimises medication availability and improves visibility between pharmacy and nursing teams.
- The patient's medication record is updated accurately and automatically in real time.
- Data is analysed for planning, procurement, reporting, and monitoring purposes, whether across a hospital, system, region, or country.
- Medicines stock is visible across a hospital and beyond making moving stock to where it's needed much easier, including in emergencies.

How does the NHS manage medicines today?

Broader work on medicines management is a national priority for the NHS, where it is widely recognised that efficiency savings present a significant opportunity for integrated care systems (ICSs) to deliver balanced financial plans. Medicines are used in almost all clinical pathways and spending on medicines consumes the second largest share of the NHS budget in England²². There is a huge prize for the NHS if it can succeed in delivering these efficiency gains.

Roles and responsibilities of medicines management

The formal introduction of ICSs in July 2022 changed how the NHS sought to manage medicines within the system. Guidance published by NHS England in July 2023²³ set out how responsibility for medicines is distributed throughout the NHS, from national to regional to local.

NHS England national team

- Annual development of national medicines optimisation opportunities.
- Issuing policy, guidance, recommendations, and resources to support systems in effecting change.
- Oversight of ICSs using national, regional and system-level data and metrics.

NHS England regional teams

- Supporting Integrated Care Boards (ICBs) in translating national priorities into local system priorities and actions.
- Ensuring appropriate governance structures are in place to support the delivery of local medicines optimisation priorities.
- Acting as a formal link between national and local medicines policy decision-makers and facilitating collaboration across a region.

Integrated Care Boards

- Using the list of national medicines optimisation opportunities to identify, prioritise and select five that align to local priorities.
- Using data and metrics to identify local medicines optimisation priorities and align these with national policy.
- Helping inform national policy by providing feedback to regional teams.

Hospital Chief Pharmacists

While ICBs are responsible for defining medicine optimisation priorities within their system, at a hospital level Chief Pharmacists play a critical role in ensuring the safe, effective, and economical use of medicines in a hospital.

Under the Medicines Act 1968, a Chief Pharmacist in a hospital is responsible for ensuring that the pharmacy service is carried out safely and effectively²⁴. They have a significant role in managing the hospital pharmacy service and/or making decisions about how the service is organised. They have overall responsibility for the procurement, storage, distribution, and use of medicines in a hospital, as well as for the development of hospital policies and procedures on medicines management. Chief Pharmacists are also often the Accountable Officer for controlled drugs in a hospital, meaning they are responsible for ensuring controlled drugs are managed in a secure and compliant manner. Chief Pharmacists are at the forefront of the adoption of innovative new technologies that can help transform the medicines pathway.

Whilst Chief Pharmacists are central to safe and effective medicines management in hospitals, ultimately, the management of medicines is a collective endeavour which requires collaboration and coordination from the national to the local level of the NHS, and across a number of healthcare professions, as well as managerial and leadership functions. Change and investment can only be brought about through agreement across those functions.

Recognising the potential of Connected Medication Management

Within efforts to increase digital capabilities, too little emphasis has been placed on the automation and digitisation of the medicines management process. To help drive change in this area and improve the management of medicines by the service, the NHS has implemented a policy of Medicines Optimisation, which is intended to be a patient centred, evidence-based approach to medication use, with the aim of improving patient outcomes, reducing patient harm, and improving value for money. Key to achieving this will be freeing up clinical staff (pharmacy, nursing and medical) from manual and repetitive tasks associated with making sure the right medicine is available when and where needed. These tasks, which are central to the management of medicines, can be automated and connected digitally and doing so can reduce the scope of medicine errors occurring and release staff to conduct more value-adding tasks that drive efficiencies.

Current pressures on the NHS today

In July 2023, the NHS celebrated its 75th birthday. The milestone was a cause for celebration, offering an opportunity to reflect on the impact the service has had on UK society since its inception. However, the occasion also offered a moment to consider the unprecedented pressure the system faces today, where long-term demographic changes have combined with financial pressures, workforce shortages and the impact of the Covid-19 pandemic leading to lengthy waiting lists for patients and significant pressures for staff.

Financial pressures

Increasing healthcare costs, an ageing population and the rising prevalence of chronic diseases are all contributing to escalating spending.

An estimated two-thirds of adults over 65 are expected to be living with multiple health conditions by 2035, while 17% would be living with four or more diseases – double the number from 2015²⁵. However, despite the systemic long-term pressures on the NHS, its budget has not kept pace with historic averages, with higher-than-expected inflation also reducing the real-terms value and purchasing power of the NHS. Research from the Institute for Fiscal Studies (IFS) estimated that, when adjusted for inflation, between 2019-20 and 2024-25 the NHS budget will only grow by 2.9% each year, compared to a historic average of 3.6% a year. This is despite additional funding for the NHS both during and after the Covid-19 pandemic²⁶.

Workforce shortages

In addition to the financial pressures the NHS is currently facing, the service is suffering a workforce crisis, with the supply of healthcare workers failing to keep pace with the rising demand for services. The Health Foundation has estimated that in 2020/21 there was a workforce gap of 115,000 full-time equivalent (FTE) staff, which on current trends is expected to double over the next five years and then exceed 475,000 FTE staff by 2033/34²⁷. Although the NHS Long Term Workforce Plan set out actions to eventually address shortfalls through increasing training places for health professionals (including pharmacists)²⁸, the severe pressure on workforce in the short to medium term will need to be addressed through the transformation of service delivery. Indeed, the plan itself is clear that even the workforce increases promised will only be sufficient if substantial productivity gains are made by the NHS.

“Almost every healthcare profession is facing shortages, including in intensive care, emergency medicine, ophthalmology, anaesthetics, neurology, microbiology and infectious diseases, speech and language therapy, respiratory medicine, dietetics, rheumatology, surgery, general practice, haematology, dermatology, paediatrics, pathology, nursing, midwifery, sexual and reproductive healthcare, occupational health, psychiatry, radiology, oncology, dentistry, pharmacy, and obstetrics and gynaecology.”²⁹

Health and Social Care Select Committee report, July 2022

Increasing pressure from rising demand for services

The NHS has long been struggling to meet the rising demand for its services, with a growing and ageing population putting stress on the system. This can be seen in A&E performance, often viewed as a bellwether for the performance of the wider system³⁰. Since 2004 the NHS has had a 4-hour waiting time standard for A&E, meaning that no patient should wait no more than four hours between attending A&E and a decision being made about their onward care or discharge³¹. The NHS has not met this standard at national level in any year since 2013/14 and the standard has been missed in every month since July 2015³². The latest data shows that currently the NHS is only meeting this target for 57% of patients³³.

The Covid-19 pandemic exacerbated these challenges. Waiting lists have grown to historic high levels. There are 7.7m people awaiting treatment in England, with over 396,000 having waited more than a year³⁴. This is putting huge additional pressure on the system, with the NHS having to focus on delivering targets for clearing the elective backlog, further limiting the resource and bandwidth it can allocate to other areas of need.

Leaders from across the government and NHS are now faced with the question: How can they unlock unprecedented efficiency and productivity savings to help secure the long-term sustainability of the NHS?

Driving productivity gains to tackle the NHS's major challenges

There is widespread acceptance across government and the NHS that the service needs to generate efficiency savings and find new ways of working if it is to meet and overcome the predominant issues of the current time.

Structural changes to boost collaborative working

In recent years, the NHS has been undergoing structural changes, moving to a system of 42 integrated care systems (ICSs), which are responsible for planning and delivering care in their geographic area. In July 2022, following the passing of the 2022 Health and Care Act, ICSs were formalised as legal entities with statutory powers and responsibilities³⁵.

One of the major aims of ICSs was to enhance collaboration within the health service, bringing together health and care organisations across a geographic area to work more closely together with the aim of better coordinating the planning delivery of care and thus making more efficient use of resources. While it is still too early to see the impact of these structural changes, the hope is that they will, over the long-term, flatten the demand curve for services by building a more preventative health system, while also better utilising all available resources. Building connectivity between the disparate parts of a system, especially between primary and secondary care is a key priority of ICSs and CMM can help achieve this aim, by linking up the medicines pathway.

HM Treasury public sector Productivity Review

In June 2023, the Chancellor of the Exchequer, Jeremy Hunt MP announced a cross-government review of public sector productivity, which he described as *“the most ambitious public sector productivity review ever undertaken by a government, with the Treasury acting as an enabler of reform”*.³⁶

With health and care due to reach 44% of all day-to-day government spending by the middle of this decade, the NHS is likely to play a significant part in the findings of the review³⁷. The Productivity Review is seeking to find an additional 0.5% of savings across the public sector with the objective *“to stop the state growing ever bigger as a proportion of our output”*³⁸. The review will offer an opportunity for the government to consider efficiency saving technology like CMM and put measures in place to support its accelerated uptake.

Efficiencies required to meet the ambitions of the Long-Term Workforce Plan

As mentioned above, the Long-Term Workforce Plan sets out a roadmap for growing the workforce to meet the demands of the future. The plan announced bold ambitions committing £2.4bn to expanding education and training places and vastly increasing the number of doctors, nurses, and other key workers within the NHS³⁹.

However, the plan itself states that its forecast of the size of the future workforce is based on an *“ambitious labour productivity assumption of up to 2%”*, which will be met through *“reducing the administrative burden through technological advancement”*⁴⁰. That means the NHS will need to successfully adopt efficiency and productivity enabling technology, such as CMM, if it is to meet the demands of the future.

Current NHS programmes to drive productivity

There are various local, regional and national efforts to increase productivity, such as attempts to undertake greater numbers of operations as day case procedures and reducing the number of outpatient appointments through schemes like Patient Initiated Follow Up⁴¹. There are also a range of technical innovations that can support self-care and better care, such as increasing use of healthcare apps and the improvement of NHS IT systems, including Electronic Patient Records and the investment in upgrading primary care telephone systems.

However, despite several efforts to increase productivity, the NHS has to date only managed an average growth in productivity of 0.9% per annum⁴².

Medicines management and optimisation in the NHS today

Medicines in the NHS today

Alongside spending on medicines, medication errors can have significant impacts on patients, as well as generating further financial pressures. Chief Pharmacists and their teams aim to deliver safe and effective medicines management and optimisation, but their success can be constrained by legacy IT or lack of prioritisation towards modernisation of the whole medicines management process. Therefore, there needs to be greater priority attached to driving efficiencies in medicines management to provide pharmacy professionals with the support and resources they need.

Digitally connecting local services to enable a smooth transition between primary and secondary care

Technology can enhance the NHS's ability to deliver joined-up clinical services across systems. For medicines this includes bringing hospital and community pharmacists closer together through digital connection across the wider health eco-system. This can support the current integration goals, helping to enable a smooth transition to a more preventative health system. This would allow patients to move between providers more seamlessly and facilitate the delivery of care for patients closer to home or in the community – all of which can help reduce the burden on the acute sector.

Increasing digital maturity of pharmacies

There have been efforts to enhance the digital capabilities of the pharmacy sector, although progress has been patchy and there is variation in capabilities across England. For example, the government has mandated that the NHS adopt patient barcode scanning by 2024. However, as of June 2023 only 31% of trusts have adopted GS1 standards for barcode scanning⁴³.

The lack of funding to support the digitisation of NHS hospital pharmacy was highlighted in the July 2023 report from the Health and Social Care Select Committee's Expert Panel on the 'evaluation of the Government's commitments in the area of pharmacy in England'⁴⁴. The report rated the government's success in supporting the introduction of digital prescribing as 'inadequate', stating that the amount of resource and funding required to achieve the aim 'requires improvement'⁴⁵.

However, pharmacy services are not alone in their slow progress of digital maturity. Enhancing the digital maturity of NHS organisations is a key priority for government and the NHS. A key measure they have put in place to achieve this is the 2021 'What Good Looks Like' guidance, and the 2022 policy paper, 'A plan for digital health and social care', both of which stated the ambition that ICSs and trusts should have core capabilities in place by 2025^{46,47}. However, the digital maturity of most NHS trusts remains relatively low and as of July 2023 only 24% of acute trusts in the UK have achieved HIMSS EMRAM (a digital maturity measure model endorsed by the NHS) level 5, 6 or 7^{48,49}. There have been significant cuts to transformation budgets, meaning progress has been slower than hoped, and there is an urgent need to take action to address this.

In October 2023, the NHS launched a new 'First of Type' project as part of the Digital Medicines Programme, setting aside £5m of new funding to support the introduction of new digital medicines technology. While this is a positive sign that the NHS is beginning to recognise the potential of digitally connecting the medicines pathway, a much greater level of funding will be required to realise the full benefits of these technologies.

Wider system benefits from CMM

As stated above, the primary focus for this Vision is on the benefits within the secondary care sector from CMM. However, there are wider benefits of digital and automation technologies for the pharmacy sector, which are worthy of further exploration on how they can support the delivery of high-quality cost-efficient services.

In community pharmacy, technologies such as automated stock input/output, enhanced inventory management, tele-consultation and 24/7 collection terminals are all enabling the provision of advanced pharmacy services, helping to transform care provision, and freeing up staff to concentrate on more high-value, revenue generating tasks⁵⁰. However, adoption of these technologies is not widespread across the sector. Supporting community pharmacies and dispensing GP practices of all sizes to adopt these technologies can help to address many of the challenges they face in delivering services and connect data flows right across the medicines pathway.

Drug shortage



of pharmacists say that drug shortage is a significant problem⁵⁵.
60% have seen delayed care as a result⁵⁵.

Waste



of hospital inventory is discarded each year⁵⁵. Approximately £100 million of unused/waste medications in the UK alone.

Efficiency



of nurse time is classed as non-value adding⁵³.

Safety



medication errors result in costs of £93 million per annum in the UK alone⁵⁴.

Unlocking new efficiencies and delivering safer care through Connected Medication Management

CMM can support the NHS in delivering its ambition to optimise medication use, delivering benefits for patients and staff, as well as driving much needed efficiency and financial savings.

In many cases the process of ordering, storing, prescribing, dispensing, transporting and administering medicines still relies too heavily on manual, unconnected systems, involving many steps. Taking a manual approach to each of these stages can result in inefficiencies, divert staff away from clinical duties and carry a risk of errors occurring⁵⁵.

Freeing up the workforce to deliver higher value tasks

CMM technology can reduce the burden of manual tasks on workers throughout a hospital, allowing them to spend more time on higher-value tasks, helping to make their work more interesting and rewarding but crucially enabling more time to be spent caring for patients⁵⁶.

Pharmacy professionals

There have been a range of surveys which have shown that the number of pharmacists and pharmacy technicians are struggling to keep up with the demand for their services. Although the number of pharmacy professionals registered with the General Pharmaceutical Council has been increasing year on year – from 75,190 at the end of May 2016 to 88,123 at the end of May 2023⁵⁷ – at the same time there have been changes in the way pharmacy professionals are working. Increasingly complex medicines such as CAR-T and genomic medicines in hospitals require new approaches and practices. Demand for pharmacy professionals is increasing, particularly in general practice where several thousand clinical pharmacists have been deployed. While this benefits patients, it also increases pressure on the pharmacy workforce across all sectors.

In addition, the shape of pharmacy professionals' roles has started to change. For example, more pharmacists are becoming independent prescribers, and from 2026 all newly qualified pharmacists will automatically be able to prescribe independently⁵⁸. Research has shown that more than 50% of a pharmacist's working time is spent on tasks considered to be non-value adding, such as preparing prescriptions and documentation tasks⁵⁹. Pharmacists want and will need to devote increasing amounts of time to patient-facing clinical activities, which means there is a requirement to free up pharmacists' and pharmacy technicians' time by relieving them of more routine tasks to apply their clinical skills for example by prescribing and administering medicines. There is a growing recognition of the need to reshape the workforce in this direction. In September 2023 an independent report by the Royal Pharmaceutical Society into Clinical Pharmacy Services at NHS Hospitals in Wales for the Welsh Government recommended an immediate "review of opportunities to improve efficiency of hospital medicines supply and logistics arrangements and release pharmacist and pharmacy technician time for clinical care"⁶⁰.

Other healthcare professionals

Other healthcare professionals, such as nurses, also dedicate a significant amount of time to medication management. Research conducted in a London teaching hospital in a standard 28-bed general surgery ward found that nurses spent nearly 47 hours per week on drug rounds, with a mean time of each drug round of 50 minutes⁶¹. Moreover, research has also shown that nurses are regularly interrupted during their work, including when they are administering medicines, which can have significant patient safety implications⁶².

How CMM can help



The number of pharmacy professionals is struggling to keep up with demand for pharmacy services.



CMM can help support pharmacists in delivering more patient-facing clinical services by automating and digitising time-consuming manual tasks.

In medical surgical units, experts have observed as many as 50 different steps in the medication management process⁶³, involving a range of professionals. By using technology to automate some of these processes, there is an opportunity to release capacity in a range of settings. For example, for anaesthetists and intensivists CMM can provide assurances on the accuracy of the medicine which a device will deliver at the point of drug administration, reducing the need for the number of manual checks required.

CMM systems in hospitals can use barcodes at all stages, from the pharmacy distribution warehouses to manufacturing units and at ward level, to ensure that the right patient is getting the right medicine at the right time, in the right dose and through the right route – the five ‘rights’ of medication management⁶⁴.

However, efforts to adopt new digital tools to relieve the burden of low-value tasks on clinical staff need to be developed in coordination with a culture of learning and education to improve the digital literacy of staff. As identified in the 2019 Topol Review on the digital future of healthcare, digital technologies will mean that a “*fundamental shift in the balance of skills in the workforce takes place over the next two decades*” and that the “*levels of digital literacy, the workforce’s awareness of the required capability, access to training and support, and skills to enable patients and citizens to improve health and wellbeing through technology will all need to be improved.*”⁶⁵

Delivering financial savings through technology, delivering better management of medicines

Unleashing the NHS’s unique data capabilities

The NHS has some of the most powerful health data in the world. As a single centralised system, the service is in the almost unique position of being able to analyse and aggregate the data relating to how medicines are used in millions of patients. However, current NHS data sets are disparate and fragmented, with legacy IT systems and new technology is often not interoperable with other parts of the system, making it challenging for the NHS to pool data and analyse it effectively⁶⁶.

Yet, there is a huge potential prize for connecting and pooling data from across the system. This includes:

1. Conducting research on the effectiveness of treatments and interventions
2. Identifying trends in diseases and health outcomes
3. Planning and allocating resource more effectively
4. Analysing medicines use data, including spending data, to identify potential efficiencies
5. Providing patients with better coordinated care
6. Enhancing patient engagement

CMM can play a key supporting role in enabling the NHS to make better use of its data, helping to digitally connect disparate parts of a hospital as well as the wider health system together and thus enriching the quality and quantity of available data.

How CMM can help



Nurses spend a significant amount of time on medication management tasks that could otherwise be spent delivering higher value patient-facing services.



CMM can automate and digitise the medicines journey, releasing nurses and other health professionals to spend more time on higher value patient-centric tasks.

How CMM can help



Data relating to medicines and their use could help transform care in the NHS, but a lack of interoperability between the technologies currently deployed across the service has made progress challenging.



CMM can help connect hospitals and the wider health system, enriching the quality and quantity of available data relating to medicines and associated workflows.

Current barriers to fully utilising the NHS's unique data

However, there are some barriers to realising these benefits. First, while medicines data standards have been agreed, these are not always adopted, and poor interoperability of digital technology, either with existing hospital infrastructure or between the technology of different suppliers, is slowing progress. Second, as highlighted in the 2022 independent government review by Professor Ben Goldacre on the 'efficient and safe use of health data in the NHS', there is a need for the NHS to create a more professionalised data analytics workforce, that has the capabilities to 'unlock all the untapped potential in NHS data'⁶⁸. These challenges are not insurmountable and through stronger collaboration of industry, the NHS, academia, and other interest groups, it is possible that system can unleash the full power of NHS data.

Medicines wastage

The NHS incurs significant costs each year through medicines wastage and diversion. Research carried out by NHS England in 2010 found that in primary care alone £300million of NHS prescribed medicines were wasted each year⁶⁹. This research has not been repeated since the initial report and so it is not clear if the situation has improved or indeed worsened in the last few years, especially as prescription volumes have increased during that time⁷⁰.

There is an urgent need to understand the scale of waste across the whole service. Addressing even a proportion of the known wastage could save significant sums for the NHS.

Medicines diversion is a significant concern, especially for controlled drugs⁷¹. Diversion of medicines involves the deliberate transfer of prescription only medicines away from the intended recipient (either an organisation or an individual) to another person for illegal use. This is a common concern with controlled drugs (such as morphine) but can occur with any prescription only medicine. Record keeping should be in place to prevent and identify medicines diversion and there is specific legislation governing record keeping associated with controlled drugs⁷². However, where these processes rely on manual record entry and keeping, there is the opportunity for error and for deliberate or perceived falsification of records, which ultimately leads to lengthy investigations and taking staff away from patient care.

It is reasonable to suggest that using technology to track medicines from the moment they arrive within an organisation, through prescription, supply and administration to the patient, would mean that there is less room for error, greater transparency on stock levels and more accurate record keeping, plus an ability to link data to other records such as patient outcomes or clinical governance audits. This could have a positive impact on the staff time required to manage medicines and, on the costs, associated with medicines wastage.

Transforming procurement

Connecting the various elements of medicines management within a hospital, and ultimately across a health system, will generate the type and quality of data that could radically change procurement of medicines. Providing that analytical capacity and capability is increased at the same time, the opportunity for the NHS to make savings or control cash flow will be significant.

Looking further upstream, it is reasonable to suggest that CMM technology can help better manage the supply and distribution of medicines by having a more accurate and transparent view of medicines stock and availability. By connecting with suppliers of medicines in a more sophisticated way, the NHS can streamline its ordering of stock, ensuring the orders flow when they are

How CMM can help



Medicines wastage causes significant annual costs for the NHS.



CMM can help better track, monitor, and predict medicines usage, reducing the scope for waste to occur.

How CMM can help



A lack of oversight of medicines inventory and supplier stock levels drives inefficiencies.



CMM can enrich data and digitally connect with suppliers of medicines, helping transform the procurement of medicines.

needed, and they have the right amount of stock in the right location. This ultimately will help with better management of current issues healthcare providers face with drug shortages. It may also be possible to introduce a consignment stock approach to medicines procurement, where charging happens at the point of use of medicine, thereby markedly improving cash flow. Moreover, the technology can help enable the use of artificial technology and machine learning, which can use real-time data to dynamically adjust inventory levels based on demand fluctuations.

Greater transparency of NHS data across systems and improved collaboration could lead to new initiatives and commercial arrangements with suppliers, as well as helping policymakers at national level in their discussions with the pharmaceutical industry, such as the Voluntary Scheme for Branded Medicines Pricing and Access Scheme or the NHS's contractual discussions with generic medicines suppliers. Given the size of the current drugs bill, a marginal saving of even just 0.02% of the medicines spend could easily pay for the technology required across the country, while delivering marked improvements in patient safety and workforce capacity⁷³.

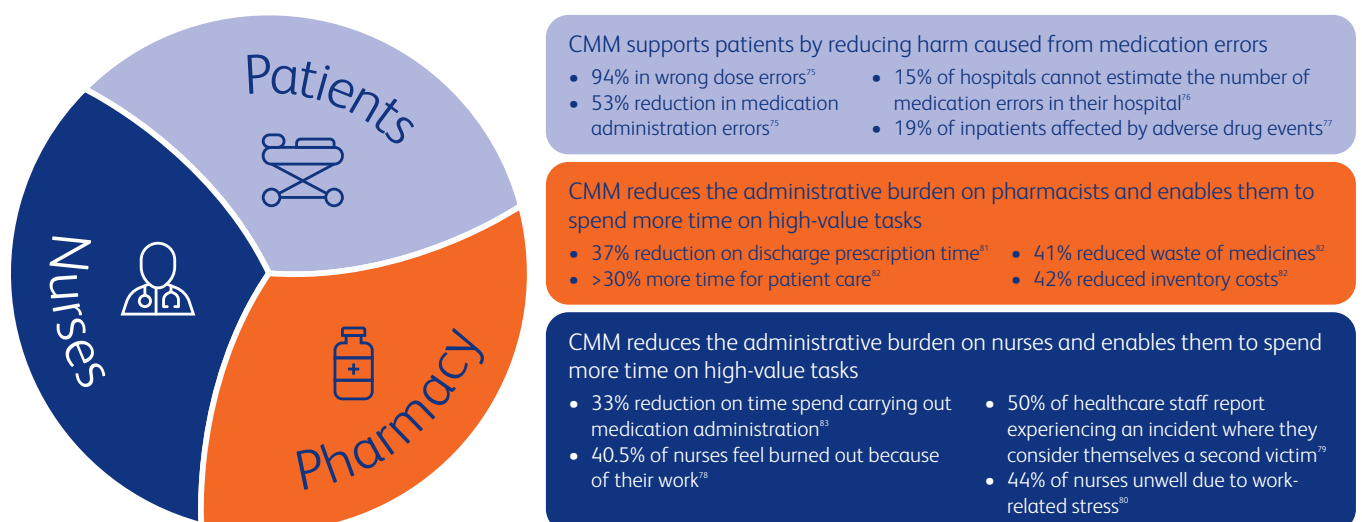
Meeting demand profiles through enhanced visibility

Better data and information flows across local, regional, and national health systems can help in planning and dealing with emergencies where life-saving medicines often need to be located quickly and moved to where they are needed. The Covid-19 pandemic highlighted the need for this, where supply chain shocks shone a light on the need for system-wide visibility of the medicines inventory. While visibility of stock within pharmacies is generally comprehensive, there can be challenges with the transparency of stocks of medicines held at ward level. In addition, there have been increasing challenges with shortages of specific medicines, some of which have led to changes in clinical practice⁷⁴. Deploying CMM more widely could support systems to accurately predict stock levels, including what the likely demand is and where the need is greatest.

A closed loop medication management process

Many clinic and hospital pharmacies have introduced automation to some elements of the medicines journey, particularly automated storage systems, and robots are increasingly common in community pharmacies. Investment in hospital e-prescribing has led to increased deployment in these systems too. However, technology could help to deliver the long-held ambition of a 'closed loop' process using technology to automate or digitise all the steps from prescription to dispensing to medicine administration. This includes not only further modernising the way that hospital pharmacies work but also transforming the ordering, storage, and administration of medicines at ward level, including the discharge of patients and the connection of all these components to e-prescribing.

Overall, better connectivity, data and analysis will lead to better oversight of utilisation and expenditure, leading to an ability to improve care and even better control of the spend on medicines.



Reducing medication errors to support the delivery of safer care

Patient safety incidents comprise any unintended or unexpected incident that could have led, or did lead, to harm to a patient. This can encompass many different types of harm, including surgical errors, hospital acquired infections and equipment failures. However, one of the largest causes of harm to patients in the UK health system is medication errors⁸⁴.

What are medication errors?

Medication errors are defined as:

“Any patient safety incidents (PSIs) where there has been an error in the process of prescribing, preparing, dispensing, administering, monitoring or providing advice on medicines.”⁸⁵

Medication errors can be caused by a range of factors, sometimes in combination, and can occur throughout the prescription journey, including with the patient.

CMM technology could help mitigate or even reduce medication errors by minimising the potential for human error within the medicines pathway. For example, by automating the picking and dispensing of medicines, digitally tracking inventory, and using scanning technology to ensure the right medication is given at the right dose to the right patient at the right time via the right route.

Quantifying the impact in reduced medication error

Research commissioned by the Department of Health and Social Care (DHSC) estimated that there are approximately 237 million medication errors in the UK annually. 66 million of these are clinically significant and either cause or contribute to 1,708 deaths each year. The estimated cost to the NHS of definitively avoidable adverse reactions to medication is £98.5million a year, approximately 3% of the total NHS budget⁸⁶.

To date, much of the focus on reducing the prevalence of patient safety incidents has been on improving and refining processes – putting in place cultural, procedural, and regulatory changes intended to minimise the scope for human error. However, the impact of these efforts is difficult to measure, as there is no single data source that provides a definitive number of avoidable deaths in hospitals. The number of incidents reported by NHS staff per month roughly doubled between 2010 and 2020, from around 99,000 to 184,000⁸⁷. However, this could reflect greater openness and willingness to report when something has gone wrong, rather than an increase in incidents.

While there has been success in raising awareness of the impact of medication errors, they still have significant consequences for patients and their loved ones, for the system, and on local communities. To continue making progress in this area, we believe there should be a new wave of patient safety reform, helping clinicians, nurses, pharmacists, and other healthcare workers by delivering and diffusing the tools, solutions, technology, and equipment across the system that can support a quantum leap forward in patient safety. There is powerful support for this within the clinical community for solutions which enable them to deliver safe and secure handling of medicines.

The following diagram provides a representation of how CMM technology could work, including connecting care settings, as a way of bringing to life the principles in this Vision Paper.

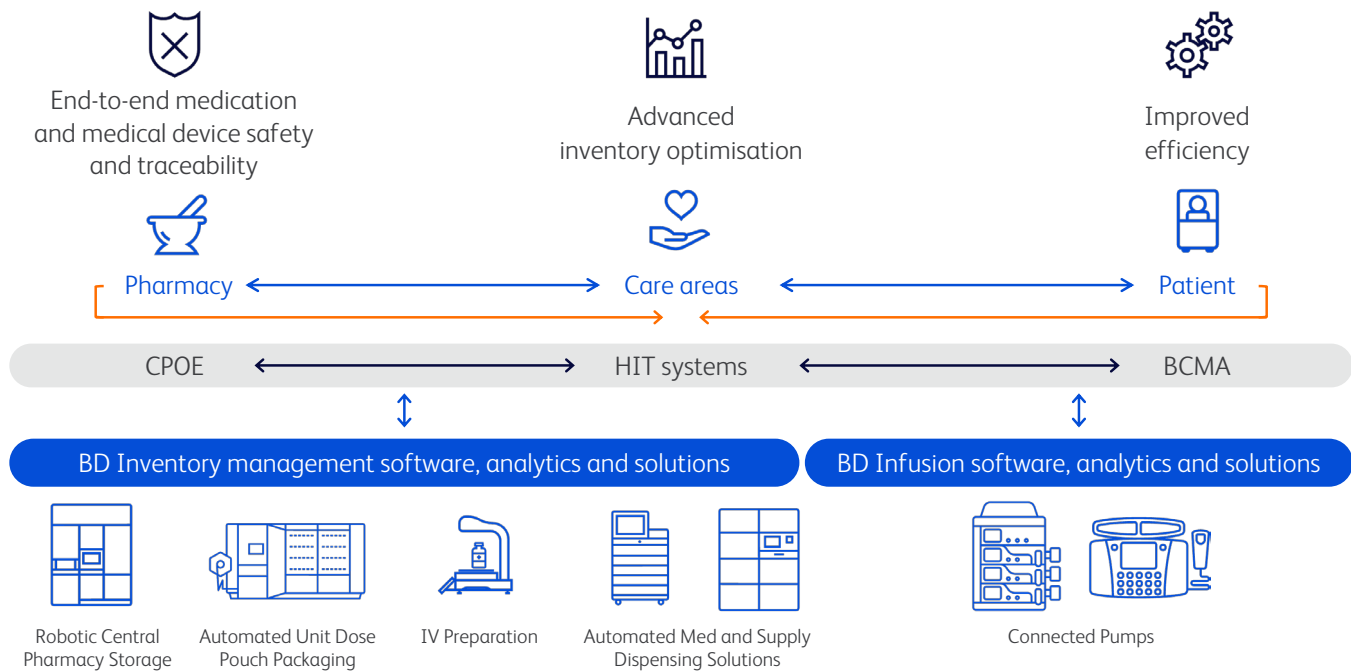
How CMM can help



Medication errors are one of the biggest contributors to patient safety incidents in the NHS.



CMM can help reduce the scope for human error throughout the complete medicines journey, with the potential to radically reduce harm caused to patients from medication errors.



Optimising performance and supporting other NHS priority policy ambitions

While the primary benefits of CMM technology are viewed as driving workforce efficiencies, creating a safer health system and empowering the use of data, the technology can also play a role in optimising performance in several other areas that are the focus of national policymakers.

Controlled drugs

Controlled drugs are subject to high levels of regulation, because of government decisions about drugs that are especially addictive and harmful. The aim of these regulations is to prevent misuse, while strengthening the governance arrangements for their legitimate use and management⁸⁸.

Controlled drugs are essential to modern clinical care and are widely used across the UK health system⁸⁹. To balance the risk of illegal misuse and harm, with legitimate use in health care, these medicines are strictly controlled, including their production, storage, prescription, supply, and destruction.

How CMM can help

- ✗ A complex regulatory landscape and rigorous enforcement of controlled drugs is creating a risk averse culture in the adoption of potentially transformative technology.
- ✓ CMM can enhance security of high risk and high-cost drugs and particularly support efforts to reduce misuse of controlled substances.

Beyond the benefits of CMM technology already highlighted, the technology brings specific advances in standards in the management and handling of controlled drugs. These include:

1. **Improved security and compliance:** enhance security measures by implementing features like biometric authentication, access control, and real-time monitoring, reducing the risk of unauthorised access or theft of controlled substances.
2. **Increased accountability and transparency:** enable the attribution of every action taken with controlled drugs to specific users, ensuring accountability and transparency in drug handling.
3. **Streamlined documentation and reporting:** simplify the record-keeping process through automated documentation and reporting capabilities, ensuring that all necessary information related to controlled drugs, such as usage, dispensing and waste, is accurately yet efficiently recorded and easily accessible for audits or regulatory compliance.

However, the complex web of regulations and legislation associated with controlled drugs is acting as a brake on investment in new digital tools, as chief pharmacists are worried that the technology does not comply with the current rules and regulations. This issue is particularly acute in the adoption of e-prescribing technology, where secondary care providers have been hesitant to move away from wholly paper-based systems because of a lack of clarity over the requirements around hand-written prescriptions and wet signatures for controlled drugs.

There needs to be a consistent understanding and interpretation across the NHS of the current regulations and related policy documents, and the flexibilities therein, while pushing forward with the wet signature legislative change being led by the Home Office. At the same time, when the Controlled Drugs (Supervision of Management and Use) Regulations 2013 are reviewed, account should be taken of the benefits of medicines management technology in improving safe and secure handling of controlled drugs.

Addressing barriers to clinical trials

In May 2023, the government published a review into commercial clinical trials in the UK led by Lord O'Shaughnessy, former UK Health Minister. His independent assessment highlighted the decline of clinical trials activity in the UK, with the number of commercially led studies supported by the National Institute of Health and Care Research (NIHR) dropping by 44% between 2018 and 2022. The review noted how the shortfall of pharmacy resources applies "*constraints to delivery of clinical trials*"⁹⁰.

Using technology to release pharmacy workers to conduct more value-added tasks can help support the government in its aim of growing the UK's commercial clinical trials sector. Moreover, it could support more widespread use of clinical research as a care option, allowing more patients to get access to cutting edge medicines, which have the potential to radically improve their prognosis.

Aseptic Services

NHS pharmacy aseptic services in England prepare injectable medicines in a sterile and controlled environment, so that they are ready to be given to patients. This is an essential service for the NHS, as injectable medicines are used to treat a wide range of conditions. Although not highly visible to patients, £3.84bn is spent on injectable medicines across the NHS in England each year⁹¹. The potential benefits of CMM technology were highlighted in the 2020 national report by Lord Carter of Coles, 'Transforming NHS Pharmacy Aseptic Services in England' which was commissioned by the Department of Health and Social Care⁹².

The Carter Review called for the introduction of hub and spoke services to help streamline the provision of care closer to home, improve patient safety by reducing errors in the preparation and administration of injections, and drive efficiencies by freeing up nurses' time, improving management of the medicines budget and offering greater supply chain resilience. The review identified the use of CMM in the digitisation and automation of manufacturing processes as an important step in delivering a more cost-effective service with appropriate support for health staff to deliver such a model of care. To ensure that the potential benefits set out in the Carter Review are realised, the NHS should set out the requirements for automation technology in aseptic services, and work with suppliers and the Medicines and Healthcare Regulatory Agency (MHRA) on the required regulatory standards.

How CMM can help



In recent years there has been a decline in the UK's clinical trial activity, with a lack of capacity in hospital pharmacies often viewed as brake on activity.



CMM can release pharmacists and pharmacy technicians from time-consuming manual tasks, enabling them to spend more time on tasks such as supporting clinical research.

How CMM can help



There is increasing demand for Aseptic Pharmacy services, particularly in the delivery of new and innovative treatments.



CMM can help automate many of the tasks and workflows required to prepare medicine and enable greater throughput.

Sustainability: Reaching Net Zero

In 2021, the government set out its landmark Net Zero strategy, detailing how it aims to deliver net zero by 2050⁹³. The strategy set out a plan for decarbonising all sectors of the UK economy.

As the UK's biggest employer and comprising nearly a tenth of the UK economy⁹⁴, the NHS has a central role to play in the decarbonisation of the UK⁹⁵. The service has set bold ambitions to delivering net zero, aiming to be the world's first net zero national health service, setting a target to reach net zero by 2040 for emissions it controls directly, with a 2045 target for emissions it does not directly control⁹⁶.

Around 25% of NHS carbon emissions are from medicines. The majority of these (80%) are from the manufacture, procurement, transport and use of medicines⁹⁷. As such, better and more streamlined management of medicines from supply chain right through to delivery to patients are central to the services net zero ambitions.

How CMM can help



The NHS is aiming to achieve net zero by 2045, with medicines a priority target area for supporting a reduction in carbon emissions.



CMM can help rationalise the management of medicines and thus support a reduction in the amount of carbon emissions for which they are responsible.

The case for change

There are untapped opportunities to drive efficiencies and financial savings across the health system, while simultaneously reducing harm to patients caused by medication errors⁹⁸. Medicines are the most common intervention in healthcare. They are used to prevent, treat and manage illnesses and represent the second highest area of spending in the NHS, after staffing costs. With the NHS facing unprecedented challenges and increasingly needing to do more with less, the effective management of medicines is critical.

As CMM is more widely adopted there will be greater understanding of the full benefits. Based on the evidence available and the visible impact of the technology on NHS services, it is possible that the following efficiencies and savings could be achieved through more widespread adoption of CMM technology:

1. Enable hospital pharmacy professionals to spend 30% more time on direct patient care, the equivalent to an additional 961 FTE hospital pharmacists across the NHS workforce a year^{99,100,101,102}.
2. Reduce the time spent by nurses on medicine related tasks by 33%, the equivalent of 1,735 additional full-time nurses across the workforce a year^{103,104,105}.
3. Save £41m a year by reducing medicines wastage in hospitals^{106,107}.
4. Reduce medication errors caused by administrative errors by 53%, the equivalent of 13.8m fewer errors a year^{108,109}.

Call to action

As a major supplier of CMM technology to the NHS, BD is calling on the government and NHS to convene experts from across the UK to undertake a targeted review of medicines management in hospitals, to identify the opportunities available through the greater use of digital technology and automation. This should be accompanied by an action plan for the implementation of a new vision for the future, including how CMM can transform care in the acute sector and its potential to join up and reform the management of medicines across the whole system.

Ahead of that review, proposed areas where action is needed to deliver change now:

- The NIHR should fund evaluations of the impact of CMM on medicines wastage, medicines diversion, staff utilisation and deployment, and the true extent of medication errors to demonstrate the case for improvement and to establish a benchmark against which progress can be measured.
- NHS England should invest in education and training to ensure pharmacy and nursing professionals have the skills and expertise to maximise the benefits of CMM.
- NHS England should develop a clear national framework to support investment in CMM and greater, coordinated uptake of digital technology to spread innovation at pace and scale.
- Following the existing commitment to Electronic Patient Record roll out, an explicit policy and system goal should be set for rolling out CMM across the acute sector.
- Provision should be made nationally in budgets for frontline digitisation to support NHS trusts through matched funding for such initiatives.
- Assessments of the digital maturity of trusts and systems should be updated to reflect the untapped potential of CMM as a digitisation programme.

BD is committed and stands ready to work in partnership with stakeholders from across the system, as we seek to support the NHS in meeting the challenges of today and paving the way for the next 75 years of supporting health and wellbeing in the UK.

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