Department of Health & Social Care

Transforming NHS Pharmacy Aseptic Services in England

A national report for the Department of Health and Social Care by Lord Carter of Coles

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Thanks and acknowledgements:

To deliver a report like this would not have been possible without the support and expertise of a long list of organisations and individuals, but I would particularly like to thank members of the English Pharmacy Aseptic Services Transformation Board for the steer they have given us over the last seven months.

I am grateful to all those who responded to the Call for Evidence and those groups asked to provide further detail in person and to David Churchward for his support during the verbal evidence sessions and beyond. I would also like to thank all those pharmacists, pharmacy technicians, procurement specialists and specialist groups who have worked closely with us on data collections to support mapping of the services and gather examples of innovative ways of working.

We also received help and advice from the commercial sector from organisation such as Bath ASU, Baxter, BBraun, BD, Loccioni, Medray and McKesson. The analytic abilities of Deloitte were invaluable in making the case for change.

Finally, I would like to thank the core team – Khola Khan, Andrew Davies and Liz Dimond - whose dedication and tenacity have delivered a compelling future vision with detailed evidence for the provision of NHS Aseptic pharmacy services.

The English Pharmacy Aseptic Services Transformation Board (EPASTB) consisted of:

- Lord Patrick Carter of Coles, Chair.
- Dr Keith Ridge, Chief Pharmaceutical Officer England, Vice-chair.
- Andrew Davies, Director of Pharmacy and Medicines Optimisation, Improvement Directorate, NHS England and NHS Improvement.
- Professor Liz Kay, Chief Pharmacist Leeds Teaching Hospitals NHS Trust.
- Dr Samantha Atkinson, Director of Inspection, Enforcement and Standards, MHRA.
- Jeannette Howe, Head of Pharmacy, DHSC.
- Gareth Arthur, Director of Strategy and Policy Specialised Commissioning, NHS England and NHS Improvement.
- Dr Rosemary Lord, Consultant Medical Oncology, Clatterbridge NHS Trust.

- Martin Machray Regional Nurse Lead, London Region, NHS England and NHS Improvement.
- Rose Willis, Efficiency Sponsorship and Accountability Branch, Department of Health and Social Care.
- Helen Poulter-Clark, Chief Pharmacist, Clatterbridge NHS Trust.
- Sarah Billington, Head of Medicines Optimisation, CQC.

Letter to Ministers:

Last Summer I was asked, by your predecessor, to review the quality, safety and resilience of the hospital-pharmacy, aseptic service.

By transforming these services, we have the chance to deliver better clinical outcomes, an improved patient experience and deliver considerable productivity gains in product costs, clinical staff time and in-patient bed days. It presents one of the best opportunities I have seen in a long time to invest to improve patient care and deliver significant savings, with the added benefit of enhancing our international status as an innovator in new medicines.

In this service, I found an unsung hero – one that is critical to our plans for the NHS – but that is little understood or lauded. Aseptically produced injectable medicines have an annual cost of £3.8 billion representing 3.1% of the total annual budget of NHS England.

NHS hospital pharmacy aseptic services provide sterile, controlled environments in which highly qualified staff prepare injectable medicines for IV transmitted antibiotics, chemotherapy and monoclonal antibodies, as well as nutrition and cutting-edge medicines for cell therapy and clinical trials. Their use enhances the quality and safety of the medicines and has the potential to allow the service to garner productivity from technological advances including automation. Most importantly, they release nursing time to be devoted to patient care and enable care closer to home.

In March 2020 my report was largely complete and focussed on the release of 4000 whole time equivalent nursing staff through a step change to the use of Ready to Administer (RtA) injectable medicines, provided by a nationally coordinated series of regional hubs and the release of over one million hospital bed days at a cost of £346m per annum.

Then COVID-19 hit. In the light of our experience and working together with the Chief Pharmaceutical Officer for England, Dr Keith Ridge, I would like to reframe my report in order to reflect what we learned during the pandemic and how it effects aseptic medicines, to:

- Recognise the positive impact of RtA injectable medicines on critically ill patients.
- Recognise the need to embed these changes in NHS clinical practice.
- Explore the opportunities to employ RtA medication in the home or in non-acute settings to relieve pressure on hospital beds.

During the pandemic, as clinicians across the country supported standardised formulae for critical and end of life care, aseptic units have been able to deliver RtA medicines for the treatment of critically ill COVID-19 patients in hospitals including the Nightingales. Nursing

staff, their movements restricted by PPE, expressed their preference for these RtA medicines and their desire to continue to use them going forward. Post pandemic we want to see the Royal Colleges continue to support standardisation of preparations and dosage to enable this transformation. In the pandemic recovery period it had become clear that we must make additional efforts to avoid unnecessary hospital admissions through improving the provision of Out-Patient Antimicrobial Therapy (OPAT) which requires increased RtA antibiotic medicines.

When I was asked to conduct this Review, I was asked to consider the resilience of the services given projected global growth in parenteral medicines in hospitals at 5% per annum and the aspirations of the NHS Long Term Plan. The Review found the current supply to be fragile, with evidence from the MHRA of deterioration in estate and facilities. The Review considered opportunities for innovation in advanced therapy medicines as well as gene therapies and personalised medicines. It covered the need for these services to support clinical trials to meet the Government's aim to treble industry contracts and R&D collaborative research over the next 10 years.

Robotic technology, which can be employed in aseptic-medicine hubs, opens up critical new opportunities for increased efficiency and productivity. We have a window of opportunity for the NHS to become a World Leader in the development of standardised aseptic services in hospitals and the home. At the same time this would allow headroom in the manufacture of bespoke medicines for the personalised, individually targeted, genomic medicines of the future. And, on the wards, it would free up nurses for patient care.

I am proposing the transformation of the aseptic services production model across England. It will need considerable investment but will yield significant returns in quality and cost. A national network of regional hubs with the capacity to produce high volume products on an industrialised scale using automated systems in off-hospital sites will free up nursing staff for the business of care, enable care closer to home and allow space for the aseptic facilities in hospitals to deliver the more complex, individualised medicines much closer to the patient.

- Using this approach and working with the NHS and commercial organisations we can
- Build a system which is resilient and has capacity.
- Remove unwarranted variations through standardisation.
- Increase safety and the transparency of quality assurance for patients.
- Assure continuity of supply.

Such fundamental changes in the operating model, moving from small over-stretched units to a fully integrated hub and spoke model will protect the bespoke medicines for individual

patients manufactured on site whilst creating the capacity to manufacture standardised products at scale, releasing significant nurse time on wards and freeing up NHS beds by enabling care closer to home.

Lord Carter of Coles

Executive Summary

What are aseptic services?

NHS Pharmacy aseptic services in England provide sterile controlled environments for the preparation of injectable medicines into Ready to Administer (RtA) formats for patients. Although not highly visible to patients, £3.84 billion is spent on injectable medicines across the NHS in England each year. Services are subject to high levels of regulatory control and quality assurance. Products include chemotherapy, injectable nutrition and clinical trials for new medicines.

This has the potential to release nursing time for care, improve patient safety and support more patient care closer to home. Pharmacy aseptic services are an essential cornerstone of many critical NHS services. They make the chemotherapy that treats cancer patients, the intravenous feed that keeps very sick children and those with intestinal failure alive and the innovative medicines that target complex diseases.

These services also provide the foundation for much of the NHS contribution to clinical trials supporting advances in medicines and contributing to the UK economy.

The case for change

Transforming pharmacy aseptic services in England will deliver:

1. improved patient experience by enabling care closer to home

2. increased patient safety by reducing errors in the manipulation and administration of these medicines

3. free up the time of 4,000 nursing staff for patient care

4. increase productivity from the medicines budget, and

5. increase the resilience of the sector.

Through the creation of regional hub and spoke services, production can be scaled up from the current 3.4 million individual doses which are prepared in English hospitals annually to over 40 million - based on the volume of the top 12 injectable antimicrobial medicines alone. This has the ability to release the time of over 4,000 whole time equivalent nurses each year who would be making up these doses on wards – a significant contribution to reducing the 36,000 nurse vacancies in England. To achieve this will require an industrial step change in production, using advances in technology including automation.

Availability of ready to use medicines could also free up over one million bed days a year releasing an estimated financial benefit of £346 million each year linked to patients in hospital solely to receive intravenous medicines without requiring in-patient nursing care instead of having their treatment in the community or at home. Such therapies might include antibiotics for soft tissue infections, community acquired pneumonias or long-standing joint infections or treatments that currently require day case appointments.

#	Drug name and units issued in 2019-2020 requiring nurse preparation	Quantity (issued)	Quantity (UOM)	% of total
1	Co-amoxiclav 1000mg/200mg powder for solution for injection vials	6,909,640	vial	14.8%
2	Piperacillin 4g/Tazobactam 500mg powder for solution for infusion vials	5,895,475	vial	12.6%
3	Fluconazole 200mg/100ml solution for infusion vials	5,342,550	vial	11.5%
4	Gentamicin 80mg/2ml solution for injection ampoules	5,257,535	ampoule	11.3%

5	Flucloxacillin 1g powder for solution for injection vials	4,272,369	vial	9.2%
6	Meropenem 1g powder for solution for injection vials	3,015,207	vial	6.5%
7	Aciclovir 500mg/20ml solution for infusion vials	2,955,838	vial	6.3%
8	Clindamycin 600mg/4ml solution for injection ampoules	2,578,184	ampoule	5.5%
9	Benzylpenicillin 1.2g & 600mg powder for solution for injection vials	2,502,494	vial	5.4%
10	Co-trimoxazole 80mg/400mg/5ml solution for infusion ampoules	2,453,618	ampoule	5.3%
11	Teicoplanin 400mg powder and solvent for solution for injection vials	1,460,232	vial	3.1%
12	Amoxicillin 1g powder for solution for injection vials	1,586,334	vial	3.4%
13	Aciclovir 250mg/10ml solution for infusion vials	1,346,342	vial	2.9%
14	Flucloxacillin 500mg powder for solution for injection vials	1,078,701	vial	2.3%
Total units to be prepared		46,654,519		
Average of 11.5 minutes to prepare total minutes		536,526,974		
Total Hours		8,942,116		
Total WTE (1950 hours/year)		4,585.70		

Figure 1 Example England wide antibiotic volumes & estimated nursing time to prepare

Large scale production of high usage medicines would also offer additional opportunities for increased productivity through standardisation of products and doses and reduce waste as short shelf life products can be supplied on a just in time basis. A resilient, standardised supply of these medicines would also lead to reduced variation in price and reduce the level of premiums paid for unnecessary individual commercial compounding of late orders.

Patient Experience

Patients able to receive their aseptic medicines at home or in the community are hugely appreciative of the freedom this gives them to get on with their lives as opposed to long stays in hospital. Hear about **'Imaad's experience'** a patient story at Leeds Teaching Hospitals NHS Trust here.

Good communication and co-production with patients is essential to help ensure that complex medicines supply and administration, such as chemotherapy, is not overly impacted by, for example, the clinical need to have recent blood tests to allow safe administration of their medicines. Optimal use of Ready to Administer standardised products available 'off the shelf' reduces delays. Direct pharmacy team involvement within clinics provide both clinical expertise and effective operational workflow planning and management to reduce delays and inconvenience to patients, whilst increasing clinical capacity. Examples of leaflets, posters and communications campaigns for these patients to improve their understanding and experience of their treatment were supplied in the Call for Evidence. Good practice in this area should be shared within the proposed networks for aseptic services.

The availability of a resilient network of high capacity aseptic hubs with the logistical infrastructure to support the national distribution of standardised injectable medicines could be used as an approach to minimise the impact of global medicines shortages, such as have been seen with the COVID-19 pandemic. The existing aseptic network was able to provide extremely valuable, short term focussed capacity to support the increased capacity essential to support aseptically prepared medicines supplied into critical care services and the Nightingale hospitals as part of the UK's response to the pandemic. However, this response was very much in extremis and would be unsustainable long term without further investment.

In a transformed service, the spoke sites – key hospitals such as cancer and genomic centres – would then focus on the bespoke or very short shelf life medicines, utilising the regional hub network supported, where appropriate, by commercial compounders to provide the large volume standardised products. Local spoke facilities would also support clinical trials for new medicines, increasing the capacity and reputation of the NHS as a global centre for research and development. Pressures on existing services will always, correctly, mean that units prioritise immediate clinical treatment for patients, such as chemotherapy over clinical trials, reducing capacity for innovation and benefit for future patients.

The need to review these services has been brought into even greater focus by national policy developments:

- The **NHS Long Term Plan** sets out ambitious targets for increased treatment of cancer, reduction in anti-microbial resistance and innovative therapy for chronic debilitating diseases – all of which are built on an assumption of sufficient flexible and resilient aseptic services, with the capacity and capability to deliver the anticipated growth in treatment regimens for these patients.

- The **NHS Interim People Plan** highlighted issues in nursing vacancies and challenges the NHS to think about what activities, currently undertaken by nurses, could be undertaken in new ways to release time for care. Preparation of aseptic medicines at ward level is one of these essential, complex and time-consuming tasks.

- The **World Health Organisation**[1] global challenge to reduce medication errors and the subsequent Economic Evaluation of Health and Care interventions (EEPRU) assessment[2] of UK medication errors highlight the importance of reduction of medication errors. Standardising the presentation of these medicines will improve patient safety by reducing errors in preparation and dosing and prevent contamination of products at ward level. The NHS Innovation and Life Sciences agendas assume capacity in aseptic services to support clinical trials of new medicines.

- The **Life sciences industrial strategy**[3] is driving the NHS Innovation and Life Sciences agendas which assume capacity in aseptic services to support clinical trials of new medicines that require aseptic preparation.

Likewise, pre COVID 19, it was widely acknowledged that hospitals were running at occupancy rates above acceptable levels based on bed capacity, with rates greater than 95% occupied beds being common. In creating the 'new NHS', the assumption will be that patients should be treated wherever possible out of hospital – in the community, their own homes, including care homes. Outpatient antibiotic therapy (OPAT) and the broader Outpatient Intravenous Therapy (OPIT) services have the potential to free up to an estimated 3,000 beds nationally on any given day. However, they are dependent on standardised, aseptically produced and ready to use intravenous medicines being available in the community. Recent research also indicates it is safer for patients, as it reduces exposure to hospital acquired infections.

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[1] The third WHO Global Patient Safety Challenge: Medication Without Harm
https://www.who.int/patientsafety/medication-safety/en/
[2] Prevalence and economic burden of medication errors in the NHS in England
http://www.eepru.org.uk/article/prevalence-and-economic-burden-of-medication-errors-in-the-nhs-in-england/
[3] Life Sciences Industrial Strategy
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/650447/LifeSciencesIndustrialStrategy_acc2.pdf

Recommendations

Doing things differently

1. Create a network of collaborative regional hub aseptic facilities to prepare large scale injectable medicines building on existing relationships (including with commercial providers). These hubs should support spoke facilities across England and ensure safe, high quality and resilient supplies by 2026/27.

2. Working with Royal Colleges and pharmacy specialists develop national guidance for standard injectable medicines. The specification for dose banded chemotherapy products will be agreed, along with parenteral nutrition and antimicrobial medicines. The standard specifications (concentrations, presentation, volume, expiry time post preparation, labelling and coding in line with the NHS Dictionary of Medicines and Devices (dm+d) and GS1 barcoding standards). NHS commissioning policy should explicitly support use of standardised products.

3. NHS England and NHS Improvement should incentivise contracts for outpatient antimicrobial therapy to care for people closer to home or at home, reducing pressure on hospital beds and improving patient experience.

4. Strengthen the accountability and responsibility around the unlicensed preparation of aseptic medicines under EL(97)52 guidance and the role of the Chief Pharmacist.

Supporting our workforce

5. Health Education England, NHS Specialist Pharmacy Services, NHS pharmaceutical production and NHS Quality Assurance/Quality Control specialists, should create policy and structures to support the training and development specification for the aseptic service workforce across England.

6. Review the potential for new roles and skill mix in aseptic services and new routes of entry.

7. Commission the National Institute for Health Research (NIHR) to undertake studies on the risks of exposure for staff to potentially hazardous parenteral products prepared in pharmacy aseptic environments. Develop systems to monitor and review global evidence on risks associated with exposure to hazardous products during aseptic preparation.

Innovation, data and technology

8. The NHS should undertake rapid evaluation of new aseptic technologies. The MHRA and NHS Quality Assurance community should collaborate to publish interpretation and operational guidance to support implementation – e.g. aseptic compounding robots. Processes for introducing these advanced technologies should be further developed and communicated with clarity on the role of the relevant Regulators, NHS commissioning and policy bodies, NICE, educators and the Professional Royal Colleges.

9. Patient safety systems including barcode technology, decision support and electronic prescribing and medicines administration must be incorporated in considerations of product specifications.

R&D and clinical trials

10. Aseptic service provision must be included in future planning of clinical trials which include the preparation of aseptically produced medicines. The Implementation Board should embed this by developing a clear narrative to increase wider research community understanding of the requirements and financial impact of aseptic service provision.

Productivity and efficiency

11. Automation should be embedded in hub sites for high volume products with suitable stability data. This should start with the ‘Top 10 medicines’ by use and demand and savings on economies of scale. National standardised product specifications should be published.

12. New longer-term contracts, monitored through key performance indicators, should be developed with NHS and commercial compounding services. Where appropriate approaches including Open Book Contract Management (OBCM) should be further developed. Only those products in compliance with nationally specified standards will be reimbursed by the NHS.

13. Where appropriate, and in the best interests of NHS patients, commercial partnerships/joint ventures should be used to bring in business expertise and capacity to support NHS aseptic service provision.

Improved clinical outcomes

14. Reductions in the number of relevant medicines errors should be tracked to monitor the impact of the removal of the manipulation of high-volume products from ward level to release nursing time for care.

15. NHS England and NHS Improvement will develop reporting on NHS aseptic service providers through the Model Health platform to ensure visibility on quality and national consistency, transparency and benchmarking.

16. The Care Quality Commission should review its oversight of the governance and assurance arrangements for aseptic services as part of the assessment of the safe and effective use of medicines in NHS trusts.

Implementation

17. NHS England and Improvement to establish an NHS Aseptic Services transformation implementation board with formal, funded programme leadership and Project Management to lead and co-ordinate the programme of work.

18. The implementation board should explore potential logistics partnerships with providers who have experience of MHRA inspected fleet services (e.g. NHS blood and ambulance services who already comply with MHRA guidelines on temperature control).

Chapter 1 - Background and case for change

The first part of this report examines the case for change together with the opportunities for transformation based on the ambitions of the NHS Long term plan.

Doing things differently	Encourage more **collaboration** between clinical and non-clinical teams to increase the scope of services they can provide **jointly** and increase the focus on NHS organisations **working with their local partners as STPs** to plan and deliver services which meet the needs of their patient communities
Supporting our workforce	Invest in recruiting, training and retaining the **optimal future workforce** for aseptic services and create **increased career pathways and opportunities** for progression, **new routes** into NHS aseptic services, such as apprenticeships and opportunities to release pressure on other professions, e.g. nursing
Innovation, data & technology	Invest in becoming an **early adopter of innovation** and support the development of the next generation of **improvement technologies** to **future proof services** and align with NHS **industrial strategy** through strategic partnerships with innovators.
R&D and clinical trials	Invest in building a **richer pipeline of R&D** proven innovations which meet the needs of patients and the NHS, **improving uptake and spread** of proven innovations and driving medical advances by ensuring **research and innovation** is an integral part of its future
Productivity and efficiency	Improve the **quality**, **productivity** and **resilience** of NHS aseptic services and identify ways to make better use of the NHS' combined buying power and reduce spend on administration to make NHS services **sustainable**
Improved clinical outcomes	Align aseptic services with clinical strategies to enable **early cancer diagnosis** and drive **improved treatment outcomes** as well delivering more **personalised** medicines and **care closer to the patients** in community settings and patients' own home.

Development of products requiring aseptic preparation prior to administration is rising at an estimated 5% per annum world-wide. The NHS Long-Term Plan intention to improve the early diagnosis and treatment of cancer means that a rise in demand for more use of injectable chemotherapy and immunotherapy is predicted as more and more people receive care. Modelling for increases in diagnostic capacity use the assumption that the numbers of people diagnosed with cancer will rise by 29% between 2016-2028. Whilst not all of those diagnosed will need drug therapy, the increase in demand is already being felt in NHS cancer centres. The growth in demand for aseptic medicines can also be linked to the increase in the medicines available and the success of the NHS in that increasing the longevity of people with chronic illness such as intestinal failure or inflammatory arthritis, means people stay on their medicines for longer. Proposals to exploit the potential of life sciences and Advanced Therapy Medicinal Products (ATMP's) will create additional demand to support clinical trials and targeted bespoke medicines for individual patients.

The last major review of NHS pharmacy medicines manufacture was undertaken in 2002 and specifically did not include aseptic services (it covered traditional pharmaceutical manufacturing only). NHS England and NHS Improvement carried out an initial review of the provision of pharmacy aseptic services including licensed and unlicensed activities, chemotherapy, and clinical trials in NHS providers either provided in-house or bought in

from the commercial sector as part of the implementation of the 2016 Carter Review[4] of NHS productivity and efficiency.

The first phase of this work demonstrated that trusts did not know the true cost of aseptically producing doses of these medicines. Many services costed the constituent materials and staff but did not include any infrastructure costs to cover the physical estate, depreciation on equipment, down time for essential cleaning including microbiology or quality management systems. The conclusion was that the current state of NHS aseptic services was unsustainable, and trusts signalled in their Hospital Pharmacy Transformation Plans that many were considering outsourcing production of RtA injectable medicines.

Although the commercial sector already provides approximately 30% of the aseptic production in England it currently lacks the capacity to meet increased demand from and unmet need in the NHS. There is ongoing capacity constraint in the UK commercial aseptic compounders market with five key suppliers closing or moving to limited output for periods of time due to regulatory interventions in the last two years. This has exposed weaknesses in current supply models and the lack of alternative suppliers when manufacture is stopped for whatever reason.

The second phase focussed on a more detailed examination of service delivery methodologies to develop costing tools and ensure that future service intentions linked with the **NHS Long Term Plan**.

- Aseptic services are one of those ‘behind the scenes’ services the NHS takes for granted until something goes wrong. The need to review these services has been brought into even greater focus by national policy developments:

- The **NHS Long Term Plan** sets out ambitious targets for increased treatment of cancer, reduction in anti-microbial resistance and innovative therapy for chronic debilitating diseases – all of which are built on an assumption of sufficient flexible and resilient aseptic services with the capacity and capability to deliver the anticipated growth in treatment regimens for these patients.

- The growing demand for aseptically produced medicines as our ability to create innovative targeted therapies to treat disease that work best with our genes – bringing personalised medicine from being an aspiration to clinical reality across the NHS in England.

- The **NHS Interim People Plan** highlighted issues in nursing vacancies and challenges the NHS to think about what activities currently undertaken by nurses could be

[4] Operational productivity and performance in English NHS acute hospitals: Unwarranted variations

undertaken in new ways to release time for care. Preparation of aseptic medicines at ward level is one of these essential, complex and time-consuming tasks.

- Standardising the presentation of these medicines will improve patient safety by reducing errors in preparation and dosing and prevent contamination of products at ward level.

- The NHS Innovation and Life Sciences agendas assume capacity in aseptic services to support clinical trials of new medicines.

- The on-going need for efficient services that make the best use of public money and enable more patients to be treated at home.

As well as the clear strategic direction of the NHS Long Term Plan, the NHS People Plan challenges us to think differently about how we work. The received wisdom in aseptic services has been that high volume, low risk products are made by nurses on wards and the higher risk, lower volume are prepared in the aseptic units in trusts. This is despite the known risks to patient safety inherent in this approach that have been unresolved since the Breckenridge report in 1974 and the subsequent National Patient Safety Agency Alert – Promoting safer use of injection medicines (NPSA 20) 2007 both of which identified the risks of ward based aseptic preparation.

The 36,000 reported vacancies in the nursing profession[5] led us to review what activities they undertake that could be done elsewhere. Aseptic preparation of medicines are processes that would lend themselves to centralisation and automation and would be an obvious approach that can free up nursing time whilst also improving the safety of patient care. The recent experiences in Intensive care facilities during the COVID 19 pandemic response has shown clearly the benefits of Ready to Administer injectable medicines.

Centralisation, industrialisation and automation of such services present their own challenges in that much of the cost of delivering these medicines is hidden in nurse salaries and consumables used in clinical areas. In addition, investment to produce standardised ready to use “off the shelf” products may have a higher acquisition cost. However, the true cost considering staff availability, time, safe patient care, consumables and the risk of repetitive strain injuries for nurses balances this cost pressure by ensuring our clinical staff time is focussed on the essential needs to care for the patient.

Likewise, pre COVID 19, it was widely acknowledged that hospitals were running at occupancy rates above acceptable levels based on bed capacity with rates greater than 95% occupied beds being common. In creating the ‘new NHS’, the assumption will be that patients should be treated wherever possible out of hospital – in the community, their own

[5]https://www.longtermplan.nhs.uk/wp-content/uploads/2019/05/Interim-NHS-People-Plan_June2019.pdf

homes, including care homes. Outpatient antibiotic therapy (OPAT) and the broader Outpatient Intravenous Therapy (OPIT) services have the potential to free up to an estimated 3,000 beds nationally on any given day but are dependent on standardised, aseptically produced and ready to use intravenous antibiotics being available in the community. Recent research also indicates it is safer for patients in that it reduces exposure to hospital acquired infections. Again, such change comes at a cost in that managing these services in the community will need additional resources and enough supply capacity to provide the ready to administer products.

The second phase uses the levers identified in the NHS Long Term Plan to look in more depth at the target operating model of creating hub and spoke arrangements for the optimal production of aseptic medicines. We then go on to describe the key drivers including transformation: standardisation, automation, workforce and regulation.

We address how these changes could be embedded and monitored by strengthening quality assurance and transforming the way aseptic services are commissioned and priced to ensure the on-going need to re-new and develop estates and equipment is built-in to maintain resilience in these services.

Finally, we have included proposals for a national Implementation Board to lead this substantial programme of work, which will require leadership, programme management and multidisciplinary working for at least three years before transition to normal business.

Following the analysis of Hospital Pharmacy Transformation Plans created as a result of recommendations from Lord Carter of Coles 2016 Operational productivity and performance in English NHS acute hospitals: Unwarranted variations report, it became clear that a number of NHS trusts were considering closing their aseptic units with a view to outsourcing supply. This, together with the fragility of the market at that stage and the withdrawal of several commercial compounders from aseptic production, generated an in-depth fact-finding study of where services were, their licensing status, what products were made and supplied to whom, the age and state of their equipment and estate, their staffing levels and costs.

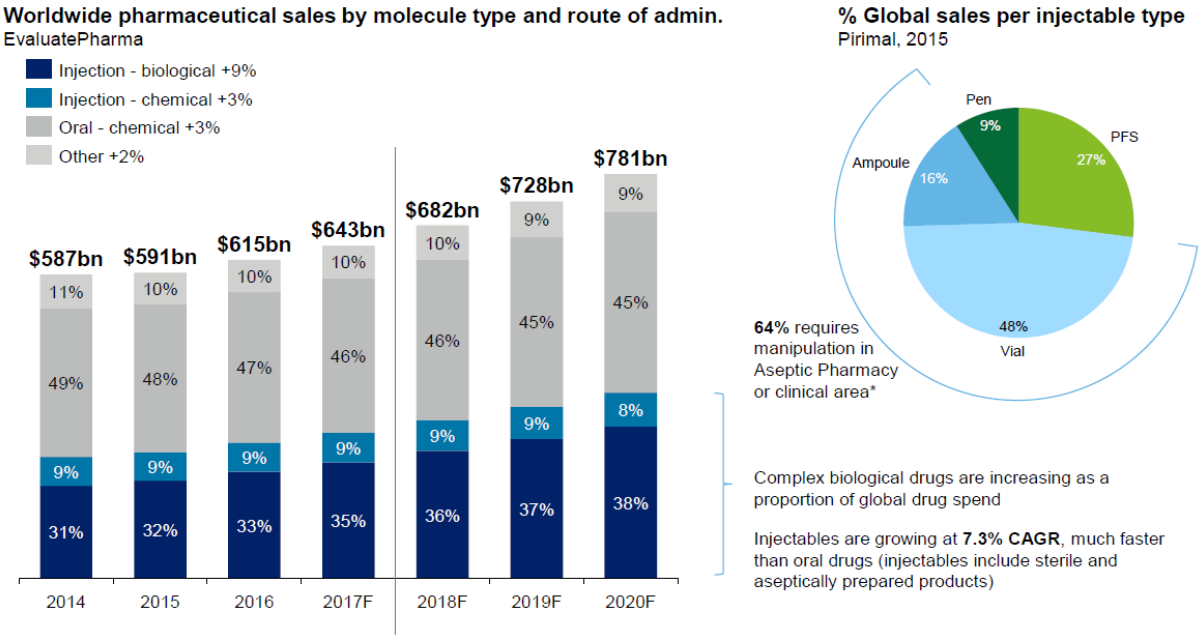

Figure 2 Growth in global pharmaceutical sales by route of administration

The case for change in how these services are delivered is strong and is further enhanced by growth in demand.

Findings from phase one and two of the fact-finding studies

Phase 1 in 2017/18 found that the current state of aseptic services in England were unsustainable and will need to transform to deliver a future-ready resilient, high quality, safe and efficient service.

Phase 2 in 2018/19 looked to understand cost distribution and validate efficiency parameters, identifying 4 strategic levers to enable transformation and improve services: standardisation, automation, outsourcing, and consolidation.

Phase 1 – Provided a country wide 'stocktake' of NHS facilities. Key findings include:

- Aging estate – Oldest facility 39 years old.
- Lack of investment in replacement facilities linked to poor awareness of service role and importance at senior NHS Trust level.
- Perception that NHS services could be closed and outsourced – when evidence shows that commercial capacity could not meet the demand.

- Lack of business approach to aseptic services with limited understanding of the true costs of in-house services.

- Commercial sector provides 30% of supply with majority made in the NHS.

Phase 2 – Identified the requirement to re-design the services to link aseptic production to the priorities within the NHS Long Term Plan and the NHS People Plan and the development of a costing model:

- Doing things differently – Encouraging more collaboration at regional and ICS level.

- Supporting our NHS Workforce – through investment in recruiting, training and retaining the optimal future workforce for aseptic services. More broadly releasing nursing time for care in direct patient care teams through provision of ready to administer injectable medicines.

- Clinical focus in support of the Cancer Strategy and other clinical specialties that require aseptic services including life sciences for example Advanced Therapeutic Medicinal Products (ATMP's) and genomics.

- Improvements to the quality, productivity, resilience & sustainability of NHS aseptic services through collaborative approaches.

In the Summer of 2019, the Department of Health and Social Care invited Lord Carter of Coles to undertake a review to deliver proposals for transforming these services. He drew together a Board of key experts to support the work and issued the Call for Evidence in September 2019.

Review aims:

To recommend the approaches necessary to deliver safe, efficient and resilient aseptic services to meet patient needs - both current requirements and the growth in demand.

Lord Carter of Coles was invited by Ministers at the Department of Health and Social Care to deliver a report by Spring 2020 which:

- Provides the target operating model for pharmacy aseptic services in England such that the NHS has a safe, reliable and sustainable supply of these medicines.

- Reviews legislative, regulatory and commissioning frameworks.

- Suggests strategic investment options for alternative futures.

NHS Long Term Plan

As well as the identified growth in demand and an unquantified area of unmet need, the NHS Long Term Plan also highlighted a number of clinical specialties where aseptic medicine production is critical to success.

- The redesign of outpatient services will require an extension in aseptically produced Ready to Use products. The initial goal was to transfer 30% of wider outpatient activity to be community or home-based care. Post COVID 19, this growth is likely not only to continue but to be accelerated as a result of the scale of change resulting from the pandemic.

- Plans for the treatment of pneumonia in the community will require aseptically produced IV antibiotics with development of national specifications and commissioning of OPAT services to maximise such care outside hospital.

- Improvements in maternity and neo-natal care assume availability of parenteral nutrition, bespoke anti-biotics and infusions.

- Children's services, in particular cancer treatments, ATMPs (Advanced Therapy Medicinal Products) and CAR-T require aseptically produced medicines.

- The adult cancer services section includes references to personalised care based on molecular diagnostics – increasing the need for smaller batch, bespoke aseptically produced medicines.

- The NHS Long Term Plan also highlights the Government's Lifesciences Industrial Strategy and the expectation of increased clinical trials using aseptic facilities. The aim is to treble industry contracts and R&D collaboration.

- There is a focus on getting best value from medicines spend for the patient and for the taxpayer through economies of scale and batch production.

- The plan explicitly states that the NHS capital regime should use its funding to support transformation and avoid short-termism.

The enablers section of the NHS Long Term Plan features workforce training requirements including the Topol Review[6] recommendations on technological improvements in clinical training together with examples of apprenticeship schemes and new non registrant roles such as the clean room supervisor at Leeds Teaching Hospitals NHS Trust and the clinical scientist apprenticeship at Barts Health NHS Trust.

[6] Topol Review: Preparing the healthcare workforce to deliver the digital future. February 2019

NHS People Plan: Releasing time to care

Historic and current practice across the NHS is that high volume/low risk aseptic products are routinely manipulated/prepared by nurses on hospital wards, with low volume/high risk products being prepared in the pharmacy aseptic facility or commercial compounding service.

There are now alternatives becoming available due to the development of high-volume automated robotic batch production of specific products currently prepared on wards use of which would release nurse time to care by producing ready-to-use medicines. This change to ready-to-administer injectable medicines would also promote patient safety by reducing risks in medication preparation & contamination risks in non-sterile conditions on the wards.

Such industrialisation and automation not only has the potential to release nurses time at ward level but also to create headroom in aseptic preparation to address existing unmet need and the estimated 5% annual growth rate in demand for innovative medicines linked to the genomic and personalisation agenda whilst optimising economies of scale & productivity.

It is likely that advances in genomics will lead to more complex medicines tailored to individuals that will likely require much more local processing due to the bespoke nature of these treatments – it is therefore essential that industrialised capacity be created to support the bulk supply processes to create the capacity needed for specialist medicines.

Investigation suggests the development of high-volume automated batch production of specific products, currently prepared on wards, will release significant nurse time to care by producing ready to use medicines. A study at Guy's and St Thomas's NHS Foundation Trust suggests as many as 40 whole time equivalent (wte) of that organisation's nurses per annum could be released by such a switch. These approaches, together with the use of ready to administer medicines during the COVID 19 pandemic have delivered real world evidence as to how using ready to administer injectable medicines contributes to patient safety by avoiding error in ward-based manipulation.

Good practice example – At the University Hospitals North Midlands NHS Trust, the MHRA-licenced manufacturing facility started to prepare batches of Piperacillin/Tazobactam infusion for the Emergency Department, to free up nursing time to care for patients. The reconstitution is a lengthy process (approximately 20 minutes in duration per vial), and it was identified that this could save substantial nursing time by being reconstituted and prepared within pharmacy. Supporting stability data was available. Nationally >480,000 vials/month are prepared by nursing staff which equated to 900+ whole time equivalent nurses time used annually.

Call for evidence

To build on the work undertaken in Phases I and II a Call for Evidence was issued in September 2019. The process closed on 31 October 2019 and 92 responses were received.

More than three quarters of the responses were from the NHS, with the rest coming from both commercial providers, and users, of aseptic products. The submissions and level of engagement was constructive and of high quality.

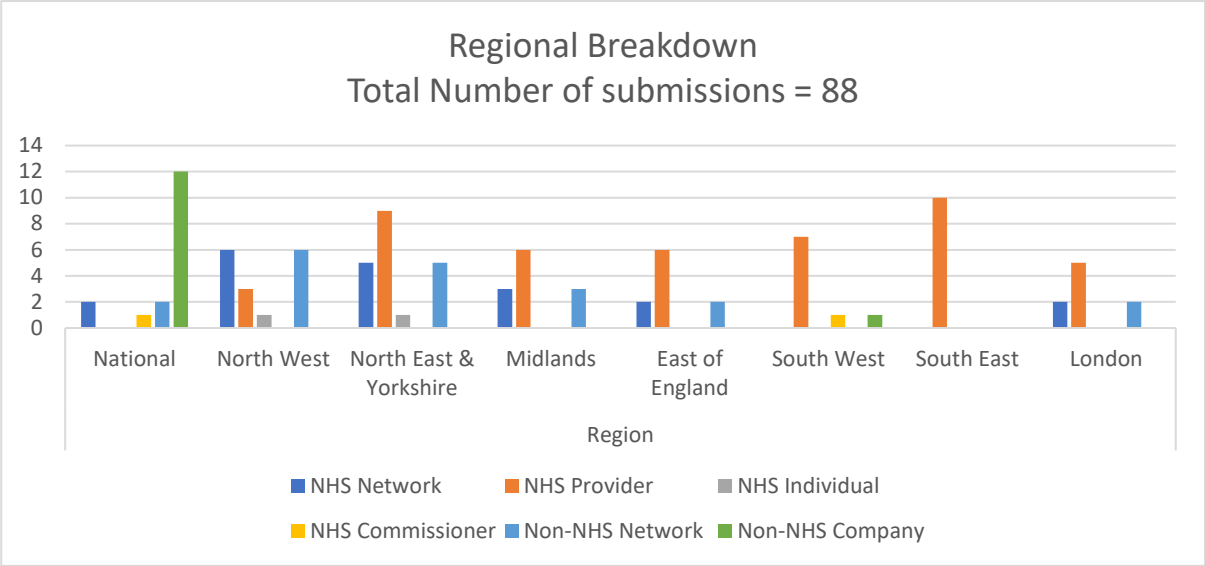

Figure 3 Summary of submissions received

Call for evidence Key themes

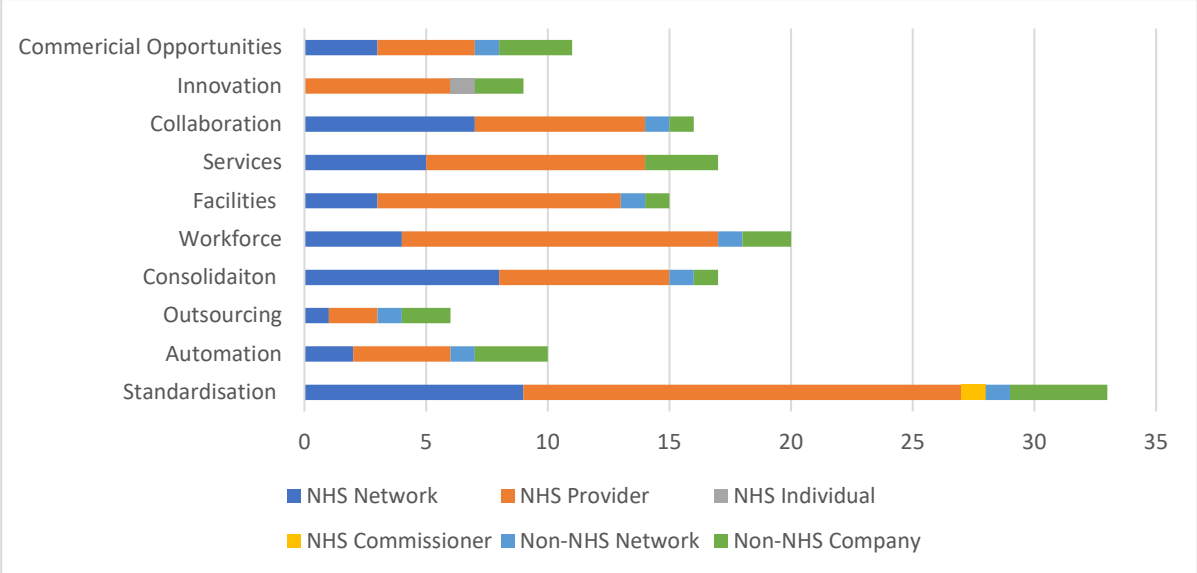

Figure 4 Key themes

Standardisation – of product, protocol or process appeared in almost every submission – NHS or commercial – as a potential solution to current and future supply issues. Many point out this will need to be supported by clinical behaviours which could include common formularies based on product catalogues, common stability regimens, NICE guidance, commissioning and financial levers, GIRFT recommendations and training.

The importance and relevance of this theme was strongly illustrated during the COVID 19 surge activity where multi-professional dialogue including with relevant Royal Colleges led to agreed national formularies for standardised injectable medicines in both critical and end of life care. This enabled aseptic production to focus on a narrow range medicines for use with all patients.

Workforce – clearer career pathways in aseptic production at all levels including training and development. Proposals for non-registrant roles, use of standardised training and standard operating procedures together with ‘passporting’ to support sharing of staff across institutions and contributions to Releasing Time for Care.

Regulation/legislation – mandatory licensing in hub sites across the NHS, options to increase licensing in spoke sites and to improve the visibility of audits for section 10 production. Improved governance and profile at national and regional levels to ensure common quality standards in both licensed and unlicensed units and to manage risk and resilience in supply.

Finance – procurement which reflects true costs, longer length of contracting, use of quality-based incentives, investment in regional aseptic infrastructure and technology. Opportunities to reduce waste and increase productivity through batch production and supply beyond an institution.

Issues raised by the call for evidence - not highlighted by phase one and two of the fact-finding exercise include:

Occupational exposure to hazardous drugs – at ward level, in particular for nurses but also in pharmacy aseptic units. Risk of repetitive strain injuries for nurses making up aseptic medicines on the ward and in compounding units where manual processes are used.

Software – digital quality management systems, technical support for standardisation, bar-coding and traceability.

Co-location – requirement and potential of co-location of aseptic services with radio pharmacy, microbiology and other emerging clinical sciences such as genomics.

Chapter 2 - The Target Operating Model

To address the issues raised in the Call for Evidence, it was recognised that English pharmacy aseptic services need to be transformed. This requires a new target operating model, standardisation of product, practice and training and improved contracting arrangements.

Doing things differently

Encourage more collaboration between clinical and non-clinical teams to increase the scope of services they can provide jointly and increase the focus on NHS organisations working with their local partners as STPs to plan and deliver services which meet the needs of their patient communities.

Creation of hubs

To deliver the necessary increase in capacity to over 40 million units per annum to release nursing time for care and enable more out of hospital care will require standardisation and automation, which can only be achieved by consolidating services in new hubs. It is proposed that a small number of regional hubs would be developed across England to create industrialised, automated facilities able to produce the 10-fold plus increase in capacity needed. The hubs may be NHS, commercial or joint ventures.

The importance of continued ability to manufacture bespoke medicines for patients at short notice or use of products with limited stability (less than 12 hours) highlighted the need for continued expertise and facilities in spoke organisations, able to support individual patient needs and clinical trials. Spoke NHS organisations would be required to obtain their high-volume products from their network's licensed hub.

The hubs should, ideally, be based in industrial estates close to key transport links. This would enable the development of large facilities able to accommodate modular aseptic units which can be upgraded to encompass dynamic design in aseptic production to keep pace with emerging science on best practice in the manufacture of these medicines without the need to constantly re-build. Their capacity would not be restrained by the existing footprint of the hospital and, of equal importance, not have to compete with other estates and maintenance priorities for estates upgrades.

Phase one of the fact-finding exercise highlighted variable use of existing NHS facilities and a significant variation in the volume of output. There was little evening or weekend working, thus the expensive estate and equipment was not optimised. Hubs will be able to

operate longer hours and weekends to increase production should it be required or in situations such as seen during the 2020 pandemic when demand increased.

The proposed national aseptic medicines networks will be developed through a process involving trusts, commissioners, regions and existing formal alliances. They will need to take account of the stability of the medicines, logistics for storage and transport, geography, population size and capacity.

The Cancer Alliances, NHS Genomic medicine services and Clinical Trial networks all have a fundamental interest in aseptic preparation facilities that support their current and future work. These networks are also strengthened through access to pharmaceutical expertise including Quality Assurance/Quality Control, pharmaceutical manufacturing and the requirements of medicines regulation (including the MHRA)

We believe that it is important to include the configuration of these key clinical networks in determining the location of the aseptic hubs.

Consideration will also be taken of the emerging genomics centres and licensed units for ATMPs (Advanced Therapy Medicinal Products) which are being established across England

As part of the Phase one work the location and license status of the English aseptics compounding units was identified together with the age of facilities and capacity constraints was determined including, the business network for the main commercial compounders.

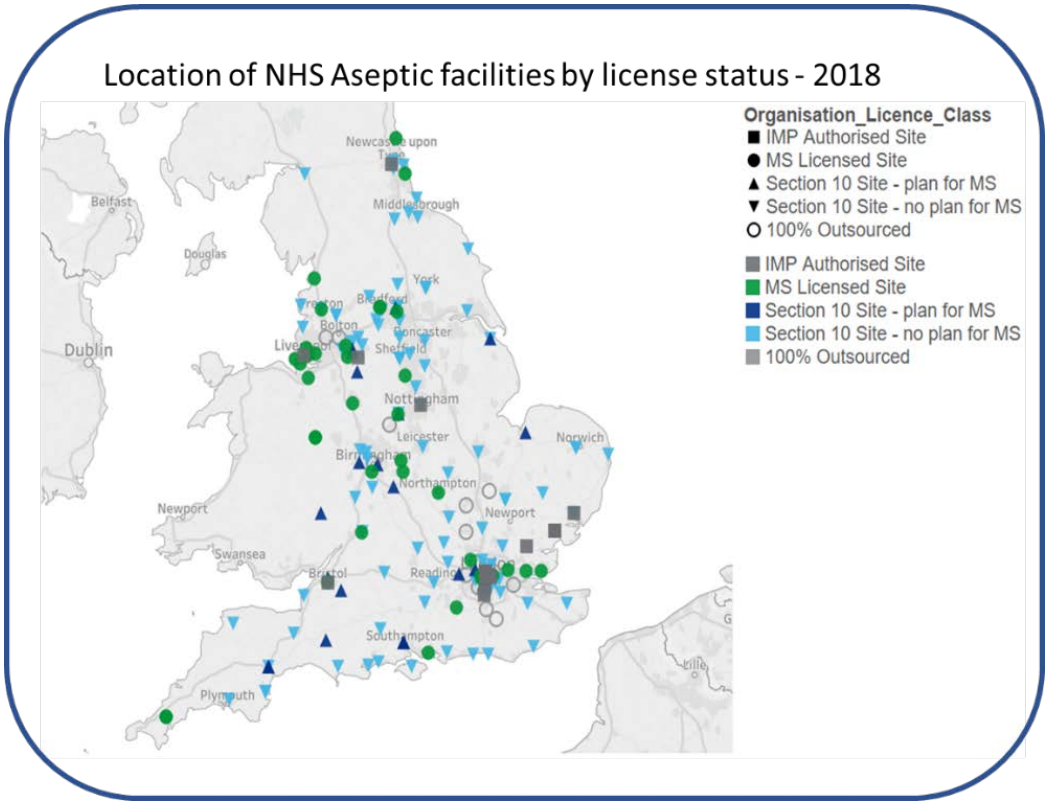

Figure 5 NHS aseptic facility and licence status

Through consultation with stakeholders and use of the analyses already conducted, factoring in geographical patient population layout of service sites collected and the patient cohorts served by each trust, proposed aseptic production networks can be formulated by the Implementation Board.

Key spokes in each area will include acute trusts, specialist hospitals such as cancer centres and children's hospitals. Integrated Care Systems (ICSs) and STPs will need to understand their existing aseptic service provision, including the state of their equipment and estate, to map their future need against clinical pathways for their population.

Standardisation

The importance of and need for standardisation – of products, protocols, processes and training appeared in almost all responses to the Call for Evidence. The overwhelming view was that consistency and **standardisation was the key potential solution to current and future supply issues**. Many respondents pointed out this will need to be supported by clinical behaviours which could include common formularies based on product catalogues, common stability regimens, NICE guidance, CQUINs, GIRFT recommendations and training. Standardisation of practice will be a key prerequisite enabler for transformation.

Standardisation of products, practices and technologies would enable the NHS to be more flexible in sharing expertise, build contingency across multiple sites and facilitate operational economies of scale where product stability permits.

There is a cyclical process of standardisation, from dose to product specification to nomenclature to method for ordering and so on:

- Dose
    - Compliance with national dose banding tables
    - Doses are grouped and rounded to a set of pre-defined doses
- Product specification
    - Starting materials
    - Concentration
    - Diluent
    - Volume
    - Fill volume for syringes/pumps
    - Withdrawal/addition process for infusion bags
    - Final container
    - Labelling including minimum information, design and wording
    - Outer packaging
- Nomenclature
    - Fit for purpose naming convention - end user, supplier and reporting
    - Used nationally for both Pharmacy stock management systems and Specials Manufacturers ordering systems
- Method for ordering
    - Outsourced products batched where possible
    - Reduce unnecessary patient specific ordering

Standardisation will also include the full implementation of the NHS dictionary of medicines and devices (dm+d), augmented by use of structured dose syntax, for aseptic products.

Working with Royal Colleges and pharmacy specialists national formularies will be developed for critical care, parenteral nutrition, antimicrobial medicines to agree standard specifications (concentrations, presentation, volume, stability, labelling and coding in line with the NHS Dictionary of Medicines and Devices (dm+d) and GS1 barcoding standards). NHS commissioning policy should support use of the formularies.

Common formularies and doses were developed at pace during the pandemic for use in critical care and end of life care. These are the sorts of beneficial changes the NHS will want to retain after the recovery period.

Recommendations:

1. Create a network of collaborative regional hub aseptic facilities to prepare large scale injectable medicines building on existing relationships (including with commercial providers). These hubs should support spoke facilities across England and ensure safe, high quality and resilient supplies by 2026/27.

2. Working with Royal Colleges and pharmacy specialists develop national guidance for standard injectable medicines. The specification for dose banded chemotherapy products will be agreed, along with parenteral nutrition and antimicrobial medicines. The standard specifications (concentrations, presentation, volume, expiry time post preparation, labelling and coding in line with the NHS Dictionary of Medicines and Devices (dm+d) and GS1 barcoding standards). NHS commissioning policy should explicitly support use of standardised products.

3. NHS England and NHS Improvement should incentivise contracts for outpatient antimicrobial therapy to care for people closer to home or at home, reducing pressure on hospital beds and improving patient experience.

4. Strengthen the accountability and responsibility around the unlicensed preparation of aseptic medicines under EL(97)52 guidance and the role of the Chief Pharmacist.

Supporting our workforce

Invest in recruiting, training and retaining the optimal future workforce for aseptic services and create increased career pathways and opportunities for progression, new routes into NHS aseptic services, such as apprenticeships and opportunities to release pressure on other professions, e.g. nursing.

The importance of a well-trained effective workforce was a key theme in both the fact-finding exercises and in the Call for Evidence submissions. The priority is the need to transform workforce development and deployment within aseptic services across all staff groups. In common with many scientific and technical areas within the NHS, there are high vacancy rates and a need for clearer career pathways at all levels to improve recruitment and retention rates.

There is currently no national co-ordinated strategy or supported infrastructure for the effective development of the pharmacy technical services workforce. A survey in the North West of England alone identified more than 63 different training programmes. Forthcoming changes in training for pharmacists and pharmacy technicians means there will be fewer opportunities for early years clinical staff to experience technical services to see whether it may be something they would like to specialise in. It is clear that there needs to be a new strategy for the development of this workforce that will include scientific staff and more apprenticeships for non-registrant roles.

Submissions to the Call for Evidence from the pharmacy professional bodies - the Association of Pharmacy Technicians UK (APTUK) and the Royal Pharmaceutical Society (RPS) put forward proposals to transform workforce development across all staff groups to ensure a resilient competent workforce to meet the future demands of the Aseptic Service and Quality Assurance.

We propose key stakeholders should work with Health Education England (HEE), building on the pilot work in the North of England, to develop a strategy for the aseptic staff education and training to deliver standardised approaches to workforce development and standardised practice. This might include:

- A central school / faculty of pharmacy technical services
    - Centralised expert resource with regional outreach to lead and co-ordinate the strategy for the development of the pharmacy technical services workforce.
    - Provision of standardised centrally approved resources / training templates.
    - Provision of virtual training spaces - removing the need to ‘practice on patients.
    - Associated teacher practitioners (variety of staff groups) / bank of accredited trainers.
- Larger aseptic units (the future hubs) support smaller ‘spoke’ units with standardised training.
- Greater requirement for the Quality Assurance and Quality Control community to coordinate and develop training resources.

- Develop apprenticeships in non-registered staff – band 2 & 3 such as those at Clatterbridge Cancer Centre in Liverpool and the Leeds Teaching Hospitals NHS Trust to create a pipeline of suitably skilled staff to support aseptic supply services.

- Increase the number of Scientist Training Programme (STP) places working within aseptic hub and spokes to create a new aseptic pharmaceutical science workforce to increase skill mix within aseptic services.

- Review Agenda for Change job profiles to focus on competency rather than qualifications to assist personnel with different experience (to traditional roles) to access key roles / career progression opportunities. This will also further support standardisation and transferability of staff.

Such an approach to training and development will facilitate transferable practice, knowledge and skills, creating a more flexible and resilient workforce able to work across systems.

Addressing the skills shortage and succession planning in aseptic services have now become key issues as a cohort of senior experienced leaders are due to retire within next five years. The pool of personnel to fill more senior positions is currently limited, for example Quality Assurance specialists are in short supply as are Qualified Persons[7]. Salaries in the commercial sector are significantly higher (up to 200-300% higher) than those in the NHS. There is a clear need to attract and train more people and to share that resource across organisations to make best use of their skills and to offer rewarding careers with options for teaching or research.

Currently there is only one location offering the national NHS programme for Qualified Persons and it is recommended that this is either replicated or expanded. There are limited resources for the growth of future qualified persons both in terms of development places and funding. This becomes especially challenging when NHS trained QP's then move to work for industry. The NHS must invest in the development of a cohort of QP's including support and required backfill for them undertaking the mandated industrial secondments. The NHS should also explore working more closely with the pharmaceutical industry to explore joint posts. The development of aseptic hub centres provides an increased need for and ideal development path for NHS QP's.

The MHRA also highlighted a specific challenge for aseptic units in acquiring sufficient access to appropriate microbiological expertise. This has a significant effect on individual facilities ability to implement and manage contamination control processes and can lead to regulatory action if there are breaches. As the NHS has world leading clinical microbiology testing services, we recommend that in developing aseptic hubs work is undertaken to

[7] https://www.rpharms.com/development/education-training/training/qualified-persons-a-guide

develop structured formal arrangements to access pharmaceutical microbiologic testing and expertise through joint working agreements.

Health & safety and staff well-being

Even before the increase in demand for ready to use products generated by the response to COVID-19, the demand for ready-to-administer injectable medicines prepared in an aseptic unit was predicted to continue to increase as a proportion of the global drug spend and injectable medicine sales are growing at 5% (phase I aseptic services review 2017/18). Preparation of the current demand and any future medicines in an aseptic unit is limited by capacity in both the NHS and the commercial sector. This has meant that Trusts have had to develop priorities of medicines that would be prepared in an aseptic unit, whilst the others are prepared by nurses on ward areas in a non-sterile environment.

There are risks for nurses and pharmacy staff preparing multiple doses of aseptic medicines, which may require shaking for over 12 minutes, of repetitive strain injury.

Low level occupational exposure has been evidenced extensively for cytotoxic medicines. However, there is limited understanding of the impact of low-level exposure to other, potentially hazardous medicines. Discovery work to understand the rate and extent of low-level exposure on nurses, when preparing injectable medicines on a ward highlighted the following.

There is a problem where long-term low-level exposure to hazardous drugs has inadvertently caused health issues (malignancies and miscarriages and in some cases leukaemia) to staff. However, there is little or no evidence stating the scale of the actual problem. There has also been a recognition globally that exposure to hazardous drugs is not limited to cytotoxic drugs. The European Directive 2004/37/EC on the protection of workers from the risks related to exposure to carcinogens and mutagens at work states that:

> ‘Hazardous drugs, including cytotoxic drugs primarily used for cancer treatment, could have genotoxic, carcinogenic or mutagenic properties. It is therefore important to protect workers who are exposed to such drugs through work involving: the preparation, administration or disposal of hazardous drugs, including cytotoxic drugs; services related to cleaning, transport, laundry or waste disposal of hazardous drugs or of materials contaminated by such drugs; or personal care for patients treated with hazardous drugs. Hazardous drugs, including cytotoxic drugs, are subject to Union measures providing for minimum requirements for the protection of health and safety of workers, in particular those provided for in Council Directive 98/24/EC (6).

> Hazardous drugs that contain substances that are also carcinogens or mutagens are subject to Directive 2004/37/EC. The Commission recommends that health services should assess the most appropriate instrument for ensuring the occupational safety of workers exposed to hazardous drugs, including cytotoxic drugs. In doing so, access to the best available treatments for patients should not be jeopardised.'

The European Commission has commissioned a review across Europe to look at the nature, the scale and cost of problems associated with occupational exposure. The outputs of this are due in 2020, where the Commission shall, taking into account the latest developments in scientific knowledge, and after appropriate consultation with relevant stakeholders, in particular health practitioners and health professionals, assess the option of amending this Directive in order to include hazardous drugs, including cytotoxic drugs, or to propose a more appropriate instrument for the purpose of ensuring the occupational safety of workers exposed to such drugs. On that basis, the Commission shall present, if appropriate, and after consulting management and labour, a legislative proposal across Europe. Spain, Italy and France are already making changes to their procedures in preparation for the forthcoming changes to the Directive.

> A Spanish Urology Nurse who was diagnosed with bladder cancer in 2000. She argued that the source of her cancer and a colleague, is the exposure to cytostatic drugs in the workplace. Some extracts from her case are:
>
> - The staff were at no time given any information from the hospital's occupational risk prevention department nor any warnings from the doctors prescribing the drugs.
>
> - No occupational risk assessment took place despite it being required by law.
>
> - The Spanish courts found that her cancer was recognised as an accident at work and she can now benefit from state provisions for occupational illnesses.

Recommendations

5. Health Education England, NHS Specialist Pharmacy Services, NHS pharmaceutical production and NHS Quality Assurance/Quality Control specialists, should create policy and structures to support the training and development specification for the aseptic service workforce across England.

6. Review of potential new roles and skill mix in aseptic services and new routes of entry.

7. Commission the National Institute for Health Research (NIHR) to undertake studies on the risks of exposure for staff to potentially hazardous parenteral products prepared in pharmacy aseptic environments. Develop systems to monitor and review global evidence on risks associated with exposure to hazardous products during aseptic preparation.

Innovation, Data & Technology

Invest in becoming an early adopter of innovation and support the development of the next generation of improvement technologies to future proof services and align with NHS industrial strategy through strategic partnerships with innovators.

Automation

A key enabler of standardisation is the ability to batch produce aseptic products. This is where automation can offer economies of scale.

The MHRA, in their response to the Call for Evidence, gave examples where compliance and quality issues have been caused by accelerated programmes of corporate procedural changes or acquisitions and mergers (in commercial and NHS sectors). The MHRA can provide guidance to the NHS on points to consider when merging pharmaceutical quality systems. Responsibility for operational delivery of these changes would remain with the NHS.

Through the MHRA's Innovation Office, the Agency has engaged with organisations in the commercial and NHS sectors considering adoption of automation solutions across a range of aseptic and non-aseptic manufacturing activities. These discussions have highlighted that traditional approaches to equipment and process design, installation and testing (equipment and process 'qualification') may not be suitable for highly automated systems which require continuous process monitoring to ensure a state of control. Experience to date is that trusts do not always have the necessary technical and engineering skills and experience to deliver these complex technologies in compliance with the requirements of good manufacturing practice. These new skills cannot be readily provided to the NHS as an outsourced service because the user requires a significant level of specialist knowledge to:

- ensure that automated processes are properly designed and monitored.
- investigate and act upon unexpected events during routine use.

Licensed hub sites should acquire automated and semi-automated units including robots that are able to manufacture aseptic products at scale. This will provide additional resilience within the system and the ability for inter hub support as well as intra hub supply. Capital should be made available to enable networks around a hub site to identify suitable sites for manufacturing. These sites should adopt a flexible build from the outset, enabling rapid upgrades as new evidence on best practice in aseptic production comes on stream.

Creation of a network for aseptic specialists to share best practice, standardised policies, training

In other NHS services, for example pathology, compliance with national standards is required. Clinical hallmarks of these processes include a single coordinated national standard and assessment process, with clear professional and contracting (through an NHS standard specification) expectations. The consistent adoption of a comparable more formalised approach to unlicensed unit audit is warranted with aseptic services in order to assure quality.

Anecdotally, some NHS Trusts facing difficulties in providing facilities and sustaining quality systems that comply with ‘Specials’ licence requirements have ‘downgraded’ their facility to continue aseptic compounding under Section 10 exemption with no regulatory oversight. This ‘downgrading’ approach is not desirable for ensuring the required standards to ensure product quality. It diverts attention from the underlying difficulties and reinforces the false perception of different standards for aseptic compounding between the two regulatory frameworks.

Evidence from the MHRA inspections identified that there is often an inter-relationship between the areas of concern identified. For example, a lack of appropriate expertise and experience within a unit can also have an impact on the way in which a pharmaceutical quality system is managed. A lack of expertise can also affect the perception of the risk associated with an event and therefore the level of work required to undertake effective controls.

Technology:

In addition to the complex technology linked to the automation and robotic systems being developed to support the compounding of aseptic medicines within ultra clean environments, the ‘digital toolbox for supporting the provision for these services is very limited. Many aseptic services use outdated labelling and worksheet tools some developed in the 1980’s. With one exception – University Hospital Southampton NHS Foundation Trust - trusts have not invested in workflow management systems meaning they are reliant on paper-based tools to identify activity, manage workload and schedule activities. In general, aseptically prepared production is not using specific chemotherapy or other compounding software, directly linked to Electronic Prescribing & Medicines Administration

(EPMA) systems. Therefore, they undertake complex interfacing or manual processes to replicate work and capture details in electronic health records.

The barcoded products required for modern Closed Loop Medicines Administration linked to EPMA that captures important data (product details, batch information and expiry date etc) and increase the assurance of patient safety when administering complex and potentially hazardous medicines cannot be created by most aseptic labelling systems – therefore without additional manual processes to add barcodes the recognised patient safety risk reduction benefits cannot be delivered. There are a wide range of digital solutions that should be integrated into modern aseptic services to remove manual processes and support monitoring and Quality Management Systems.

Good Practice - Southampton Medcura workflow management system case study

Description of model

- Southampton Oncology Unit developed a bespoke electronic compounding management system to improve workflow by automating the processes most prone to human errors, which accounted for approx. '62-92%' of reported errors.

- It is an integrated IT system controlling the compounding service from order receipt through management of raw materials and production process, to product release and patient administration. It is currently used for **placing order and producing the relating worksheets and labels electronically** without the need for manual calculations or transcription.

- There were eight areas of focus: raw material stock control, finished product document masters, order management, scheduling and picking, electronic compounding, inspection and labelling, release and dispatch.

Requirements for success / Critical success factors

- For best results, an iterative design process was encouraged based on the user requirements and as a result, eight areas of focus were identified. Providing that targeted areas are chosen, the ACMS can identify areas that can be improved e.g. measurements of workflow, productivity and raw material usage.

Advantages and benefits

- Controls scheduling as well and **removing the risk of internal errors** could improve this workflow and reduce pressure peaks

- **Improved chemotherapy capacity**, with improved real time information on product statuses and available resources
- Better, **more productive** use of staff time
- Plans to enhance system with barcode scanners and automated in-process checks using ICU's Diana
- Internal error rates **decreased from 2.85% to 2.23% post implementation**
- Decrease of **98% and 94.3% in label generation and worksheet preparation errors**

Disadvantages / challenges / barriers

- Developing a system in-house can be costly and requires dedicated resources
- Requires funding and resource to scale

Recommendations:

8. The NHS should undertake rapid evaluation of new aseptic technologies. The MHRA and NHS Quality Assurance community should collaborate to publish interpretation and operational guidance to support implementation – e.g. aseptic compounding robots. Processes for introducing these advanced technologies should be further developed and communicated with clarity on the role of the relevant Regulators, NHS commissioning and policy bodies, NICE, educators and the Professional Royal Colleges.

9. Patient safety systems including barcode technology, decision support and electronic prescribing and medicines administration must be incorporated in considerations of product specifications.

R&D and clinical trials

Invest in building a richer pipeline of R&D proven innovations which meet the needs of patients and the NHS, improving uptake and spread of proven innovations and driving medical advances by ensuring research and innovation is an integral part of its future.

Support for clinical research requiring aseptically compounded medicines

The resourcing of, including for capital investment and equipment renewal is a clear theme in aseptic services that are unable to fully support the provision of aseptically compounded

clinical trial medicines. Where there is failure to maintain facilities to the currently required standard, or to provide new or refurbished facilities to replace those that have reached the end of their design life and with sufficient capacity clinical trial support can be restricted and potential regulatory issues can further restrict capacity and capability for clinical research. This is often due to a lack of joined up strategic planning of research activity to recognise the need for and costs of aseptic capacity.

Recommendations:

10. Aseptic service provision must be included in future planning of clinical trials which include the preparation of aseptically produced medicines. The Implementation Board should embed this by developing a clear narrative to increase wider research community understanding of the requirements and financial impact of aseptic service provision.

Productivity and efficiency

Improve the quality, productivity and resilience of NHS aseptic services and identify ways to make better use of the NHS' combined buying power and reduce spend on administration to make NHS services sustainable.

Collaborative services

Evidence collated through the aseptic review process has shown that transferring the production of high-volume aseptic medicines to a regional hub (NHS, commercial or a joint venture) would provide opportunities to exploit economies of scale together with increased capacity to provide aseptically prepared products. Buying in rather than making has been seen as a risk-reducing measure by some NHS Trusts who do not want to carry the resourcing burden of maintaining or updating their own estate, equipment and facilities. However, the creation of a hub and spoke model will require areas take strategic decisions on investment in existing aseptic units and hubs start to deliver products that are stable enough for batch production. Work has already started within West Yorkshire and Harrogate (the WYAAT group of acute trusts) which will provide a potential blueprint for such collaborative services.

In addition to the pharmaceutical aspects of collaborative working there are opportunities linked to other associated activities – one example is the logistics requirement for licensed delivery vehicles. Evidence submitted to the Board outlined work with existing suppliers such as the North West Ambulance Service and the NHS Blood and Transplant Service which already have MHRA inspected temperature-controlled fleet.

Estates/Infrastructure

To embed the recommendations of the review there is the need for significant strategic investment in pharmacy production facilities to maintain ‘fit for purpose’ NHS aseptic dispensing capabilities for the future. It is recommended that through the NHS Regional structures, NHS England and NHS Improvement will leverage its approval processes for NHS trust transformation plans and capital business cases to ensure approval of aseptic business cases fit with the future strategic direction for these services.

NHSI/E will not approve business case for aseptic units without ensuring full alignment with the strategic intent identified within this report and taking account of the hub and spoke model of transformation. This will ensure that capital investment is targeted in the right place to create a resilient service for the future.

Historically it has been challenging to obtain trust executive management approval for funding to deliver pharmacy aseptic services. It is often cited as the reason for lack of capital investment in facilities and quality management systems. Without executive support for investment, chief pharmacists struggle to address the challenges facing their aseptic compounding services.

The MHRA has seen evidence that suggests senior trust leadership can lack detailed understanding of aseptic compounding, their legal responsibilities, resourcing requirements and face competing priorities with funding of patient facing activities. Reporting structures in NHS Trusts contribute to the lack of empowerment of aseptic compounding facility leaders and inappropriate organisational reporting lines to the executive team (examples include via pathology, nuclear medicine or support services directorates) can exacerbate this. Aseptic units often experience:

- Conflict between spending priorities

- Diversion of profits from their external sales of compounded or manufactured medicines into the Trust-wide budget, requiring bids for capital expenditure and difficulty in multi-year re-investment planning.

Creating a sustainable and resilient system - Finance, contracting & procurement

The true cost of producing aseptic medicines including infrastructure costs required to maintain the estate, equipment and facilities which must be reflected in the price of these products whether the source is NHS or the commercial sector. Without a proper understanding of the costing model, improvements made to the service will not be sustainable. Both Phase I and Phase II of the aseptic review demonstrated the lack of a business-like approach to aseptic services and products in the NHS. Trusts could not

identify all the costs of producing a dose of aseptic medicine. Many gave staff salary and pre-cursor material costs but nothing for training, estates, employment costs, Quality assurance, validation, equipment or cleaning. This gave a false basis for costings with some suggestions that commercial suppliers were making excessive profits at NHS expense. There was no evidence from Companies' House to support this and in fact, several companies had withdrawn from the market or struggled to invest and maintain regulatory compliance due to the slim profit margins and need for significant investment to maintain quality standards reducing the overall capacity in the UK.

However, there are productivity savings to be made in aseptic services through the standardisation of products and increased use of dose banding. Better planning and ordering of medicines would also decrease costs as late orders for single doses are inherently more expensive. The premium associated with last minute ordering which requires individual preparation can be an additional £30 per dose plus carriage charges.

Clinicians should be encouraged to use standard doses wherever possible, as these can be batch produced at lower cost. Some variation in doses is clinically warranted but ongoing work undertaken by the South West Procurement team has shown that significant efficiency savings could be made by targeting products of high use for standardisation and incentivising compounders to keep batch stock 'on the shelf' to support rapid supply.

Cost vs. price of products

The current 'lowest price' models of contracting for out-sourced (NHS or commercial sector) aseptic products are not fit for purpose as they do not adequately reflect the costs of providing the necessary pharmaceutical quality management systems to meet essential regulatory requirements.

As part of the review alternative pricing models, as used in other national markets that require significant long-term capital investment, for example the utilities markets – gas, electricity and water, were discussed with the UK Competition and Markets Authority (CMA) to understand if there were lessons for other options to develop a sustainable model of supply of aseptic medicines.

The CMA considers the challenges of statutory regulation for pricing and indicated that this model is usually adopted where there is little competition in a market to maintain a price cap and there are major medium to long term (25-50 year) infrastructure costs such as distribution networks and services where infrastructure, once in situ, is shared. In relation to NHS access to aseptic compounding **there is competition in the commercial market**. Indeed, the NHS has a near monopsony as the main buyer of these products in the UK and has used its purchasing power to drive a value for money agenda.

Phase 1 of the aseptic review work assessed existing models for procurement and contracting of aseptic products undertaken by the NHS be that from the commercial sector or within the NHS. The focus on lowest price is leading to a poor return on the significant capital investment required for maintaining aseptic compounding infrastructure.

It found that NHS pricing approaches had resulted in low, single digit operating margins (5.1%) and EBITDA – earnings before interest, tax, depreciation and amortization - of (6.5%) within the commercial market. This restricts aseptic units' ability to fund future capital investments and prompts suppliers to divest unprofitable product lines or exit the market entirely.

Facilities producing aseptic medicines are subject to strict regulations. Over the past few years, in order to protect patients the Medicine and Healthcare products Regulatory Agency (MHRA) has needed to take regulatory action with several commercial and NHS providers. Some licenses have been suspended and others have had their output significantly restricted, affecting the capacity of the NHS to treat patients. The commercial market is already unable to meet existing demand for aseptic services. Without a change in pricing structures, it is unlikely to invest to meet the growing demands linked to new products and unmet need across the NHS.

Further discussions were held with NHS England Supply Chain Co-ordination Limited (SCCL) as to approaches used for non- medicines contracting. An alternative approach identified was the use 'Open Book Contract Management' (OBCM) which is a cross government approach developed by the Cabinet Office whereby the NHS would pay true costs, thus suppliers are never driven into loss. However, profit can only be made when objectives are being met based on clear key performance indicators (KPIs). The contractor has mechanisms to look at the supplier's books and see all their costs (at a granular level). Service related KPI's can be used to adjust allowable profit.

There are published standards for OBCM – Open Book Contract Management with more information available from Crown Commercial Services/Cabinet Office[8].

The current regulatory framework overseen by the MHRA, provides assurance on quality and safety but has no powers or responsibilities regarding cost.

The NHS should seek to maintain a mixed economy of suppliers in aseptic products and therefore needs to consider alternative contracting methods utilising aspects of the OBCM or other commercial structures and connect this with a greater understanding of the impact of the regulatory model ensuring prices reflect the total cost of sustainable production.

[8] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/525283/obcm_guidance_final.pdf

To allow suppliers – NHS or commercial - to recover both operating costs and capital without requiring appropriate pricing, future contracts would need to be of sufficient length (10 years plus) to give suppliers confidence to invest in facilities and to reduce front loading of cost in product price to allow full recovery of investments. Income in the NHS would need to be directed back into the service rather than seen as a trust or ICS wide resource.

The NHS should use its contracting levers to change the way aseptic services are commissioned at national, regional and ICS level to ensure sustainable, resilient supply and to drive savings through standardisation.

Additional key performance indicators might include reducing waste and improvements in line with the Greener NHS agenda.

Meeting the NHS Long Term Plan Productivity and Efficiency Challenge - the 5 Tests

- **Test 1: NHS will return to financial balance**

- **Test 2:** NHS will achieve cash releasing productivity growth of at least 1.1% per annum **NHS Long Term Plan: Contributing to cash-releasing productivity growth** – The work to establish a baseline for aseptic services in England showed that significant savings could be made by driving out unwarranted variation in the costs of aseptic medicines production. NHS Specialised Commissioning **spends over £1.5 billion on IV chemotherapy and parenteral nutrition** alone each year and preparative service on-costs charged to them vary from 0 to 12.5% for these products. There is significant variance in clinical approaches to the choice of medicines dosing, procurement prices and standardisation. As an example, a cancer therapy – Bortezomib, has 41 separate versions of the same 2.5mg syringe being ordered from a single supplier, at prices ranging from £640-£923 per dose. Standardisation to a single version would support improve productivity allowing maximisation of batch production and financial benefits. It is estimated that savings of £100m per annum could be achieved overall through a transformed pharmacy aseptic service.

- **Test 3: NHS will reduce growth in demand for care through better integration and prevention** – Develop standard contracting and support for OPAT/OPIT services to support NHS services closer to Home and release hospital beds, support anti-microbial stewardship to avoid growth in anti-biotic resistant infections. This could release over one million hospital bed days each year at a saving of £346 million.

- **Test 4: NHS will reduce unjustified variation in performance** - Develop lean competencies for hubs Focus on product flow, waste reduction, efficiency, optimal batch sizes, and productivity.

Develop agile competencies for spokes. Focus on information flow and visibility of upstream demand and orders i.e. prescriptions and clinics. Focus on flexibility, continuous improvement to shorten lead times, customer service metrics, and responsiveness.

- **Test 5: The NHS will make better use of capital investment** and its existing assets to drive transformation. Lack of strategic investment is not cost neutral as the NHS will need to maintain existing facilities which is estimated at over £60m per annum.

Recommendations:

11. Automation should be embedded in hub sites for high volume products with suitable stability data. This should start with the 'Top 10 medicines' by use and demand and savings on economies of scale. National standardised product specifications should be published.

12. New longer-term contracts, monitored through key performance indicators, should be developed with NHS and commercial compounding services. Where appropriate approaches including Open Book Contract Management (OBCM) should be further developed. Only those products in compliance with nationally specified standards will be reimbursed by the NHS.

13. Where appropriate, and in the best interests of NHS patients, commercial partnerships/joint ventures should be used to bring in business expertise and capacity to support NHS aseptic service provision.

Improved clinical outcomes

Align aseptic services with clinical strategies to enable early cancer diagnosis and drive improved treatment outcomes as well as delivering more personalised medicines and care closer to the patients in community settings and patients' own home.

Reducing variation

Over recent years NHS programmes such as Getting it Right First Time (GIRFT) and NHS RightCare have focussed on evidence-based interventions and addressing variation. From the evidence gathered through the aseptic service review programme it is clear that there remains significant unwarranted variation in aseptic medicines and their presentation, supply process, labelling and quality across England.

The national approach during the COVID 19 pandemic response also highlighted the opportunities around clinical standardisation through work with the Royal Colleges, product standardisation and the need for greater understanding of the drivers of variation.

Clinicians on the Transformation Board were convincing in their views that there were very few instances where there was a clinical need for variance – it is much more associated with disparate pharmacy functional requirements (clinical vs technical services vs procurement), historical processes and IT systems and local beliefs, all of which need to be challenged.

For NHS England and NHS Improvement Specialised Commissioning Services the Medicines Optimisation Clinical Reference Group developed the NHS in England's approach to dose banding that is currently in place. Through the 'Just get it done' workstream it is clear that not all organisations and pharmacy services have fully implemented this approach to standardisation. From the interim work that has been undertaken during the aseptic review period, several issues have been identified:

- Lack of a specific naming conventions for aseptically prepared medicines – as compounded medicines have historically been excluded from the NHS Dictionary of Medicines and Devices (dm+d), the standard for medicines and medical devices interoperability within digital systems. Each trust has used their own naming structure – this has significant impact on suppliers trying to standardise products.

- The initial product specifications developed for the NHS Dose Banding tables did not correlate concentrations, ranges and volumes with stability data leading to organisations deviating from the standard products. The specifications also did not include labelling standards, utilising dm+d names, and structured dose syntax.

- Product specifications require a template and structure that supports both in-house and outsourced supply to encourage outsourcing as a batch for more products.

- Local engrained practices based on historic information and professional silos that have led to unwarranted variation from nationally agreed standards.

It is important to continue to develop the understanding as to why systems haven't been introduced. Also, to address cultural, clinical and technical barriers to introduction of these essential changes and create a comprehensive blueprint for improved dose banding and product specifications. Future shared stability studies will need to be held in one place where they can be linked to product defect reports and quality investigations across the NHS.

Quality and Safety - NHS Pharmacy Aseptic Services: Inspections, Assurance and Governance

Aseptic services are the highest risk area in NHS provider pharmacy supply provision. Therefore, the systems of quality assurance and governance processes are critical.

Facilities producing aseptic medicines are subject to strict regulations. The UK regulates compounding facilities (and other medicines related activities) via two legislative routes:

1.1 Under the direct supervision of a pharmacist who takes personal responsibility for quality (under section 10 of Medicines Act 1968, which exempts pharmacists from the requirements of a marketing authorisation and manufacturing licence, in certain circumstances), or

1.2 Under an authorisation granted by Medicines and Healthcare products Regulatory Agency (MHRA) - an executive agency of the Department of Health and Social Care). The MHRA regulates medicines to ensure that they meet applicable standards of safety, quality and efficacy. Their role includes the licensing of medicines and regulatory inspections of licensed medicines manufacturers to ensure that they comply with the principles of good manufacturing practice (GMP). This includes hospital pharmacy aseptic dispensing facilities operating under a 'Specials' manufacturing licence.

A substantial proportion of NHS aseptic compounding workload consists of single, patient-specific doses intended for administration within the product expiry time or within seven days of preparation, which are not suitable for manufacturing in batches. It is for this type and level of activity in particular that the regulatory flexibility allowed by Section 10 of the Medicines Act 1968 (the pharmacist exemption) applies in respect to aseptic preparation. A Department of Health Executive Letter in 1997 (EL(97)52) formalised governance arrangements for aseptic dispensing within the NHS. It introduced the requirement for a quality assurance audit process by the NHS regional quality assurance (RQA) pharmacists to identify deficiencies in local units that require addressing to ensure that hospital pharmacy services continue to have the capacity and capability to safely meet the needs of patients.

The EL(97)52 quality assurance process is overseen by the Regional Quality Assurance function, which now forms part of the NHS Specialist Pharmacy Service (commissioned by NHS England and NHS Improvement). Executive Letters have not been utilised within the NHS since 1998 and therefore the importance and understanding at trust board level of such historical requirements has diminished. This has reduced the impact of EL(97)52 reports and the necessary accountability and responsibility for meeting these legislative requirements outside the pharmacy world. The inspection system outlined in EL(97)52 does not have the same statutory penalties as the MHRA inspections of licensed facilities, and there is a stated perception that it is therefore less effective. The lack of a public profile or widely published reporting adds to perceptions that the system lacks transparency.

It is proposed therefore that the current scheme is updated over the next year with full implementation by 2025 to modernise the authorities and responsibilities on NHS organisations associated with the existing EL(97)52 audit system. The new scheme for

unlicensed facilities should sit with the quality assurance and quality control community, currently housed in NHS England and NHS Improvement's Specialist Pharmacy Services providing an equivalent role to formal External Quality Assurance (EQA) schemes as governed by discipline-specific experts. Such schemes identify the appropriate performance and functioning of a service using criteria based on agreed standards. Such national standards should be developed jointly with the medicines regulator and applied consistently as it relates specifically to aseptic medicine preparation and assembly activity that can be undertaken under the supervision of a pharmacist.

Currently the collation of metrics and audit findings, undertaken within the Specialist Pharmacy Service (SPS), is maintained on an Excel spreadsheet with limited access. A more transparent and robust method of data collection is needed to provide a single, centralised view of the status of the aseptic services and promote transparency for the service and public alike. The MHRA currently does not routinely share their assessments of NHS and commercial licensed specials units. Greater transparency and communications especially with NHS England and NHS Improvement Regional Chief Pharmacists should be considered together with consistency across NHS Regions as to the assurance and governance processes used to escalate concerns to Chief Executives of provider organisations.

New sanctions for poor performance should be developed and tied into commissioning and service contracts. If a manufacturing unit, hub or spoke, is unable to meet the required safety standards, they will not be able to provide aseptic products that support key patient pathways for cancer and other conditions.

NHS England and NHS Improvement along with the MHRA should consider how they might provide more transparent regular reports to the NHS on trends and errors in aseptic services to ensure a focus on continuous improvement.

Chief Pharmacists have an important role to play in ensuring the safe and effective operation of hospital pharmacy services, including aseptic services. It is expected that the role of the Chief Pharmacist will be given a statutory underpinning, as part of the Department of Health and Social Care's programme to rebalance medicines legislation and pharmacy regulation.

The Care Quality Commission (CQC) should take into consideration the outputs from the EQA and accreditation schemes as part of their assessment of whether NHS services are safe, effective, caring, responsive to people's needs and well-led. This additional information will support a richer and broader understanding of the quality of service provided and enable commentary on leadership and governance in these areas.

Recommendations:

14. Reductions in the number of relevant medicines errors should be tracked to monitor the impact of the removal of the manipulation of high-volume products from ward level to release nursing time for care.

15. NHS England and NHS Improvement will develop reporting on NHS aseptic service providers through the Model Health platform to ensure visibility on quality and national consistency, transparency and benchmarking.

16. The Care Quality Commission should review its oversight of the governance and assurance arrangements for aseptic services as part of the assessment of the safe and effective use of medicines in NHS trusts.

Chapter 3 - Implementation

Implementation board

To provide the necessary capacity, leadership and governance to support such widespread change in aseptic services across England will require a co-ordinated, funded programme of work with a senior national lead and project management support.

NHS England and NHS Improvement should establish an NHS Aseptic Services transformation implementation board to provide the technical, regulatory and operational expertise required. This board should transition into a national aseptic service steering board linked to the NHS Specialist Pharmacy Service as transformation completes. The Implementation Board will co-ordinate the work of the system at national, regional and local level to oversee the necessary strategic investment to ensure the delivery of a sustainable and resilient aseptic service that can meet current need, and future growth, in aseptic production.

The level of engagement from stakeholders in both the fact-finding phases and the Call for Evidence has demonstrated significant insight and appetite for change. The Implementation Board should build on this to include all stakeholders in the design of the change. The Board should include representation from subject matter experts in aseptic services, from operations to quality assurance expertise together with key users of the services such as cancer specialists, antimicrobial chemotherapy specialists, the research community, the life science industry, regulators, education, commercial experts, commissioners, finance and policy makers. Invitations should also be extended to the Devolved Nations acknowledging historical cross border supply routes and the opportunities for shared learning.

Most importantly, the Board should engage with patients and their representative organisations in the design of new services. Key groups such as cancer patients and those with chronic conditions have established local and national networks who should be invited to sit on the Board and to shape its work.

The Implementation Board should monitor progress against the recommendations and report on this to the NHSE/I Board and DHSC. The Board should publish reports on the key milestones of the transformed service and regular updates on progress on implementation of the recommendations. The Implementation Board should also work closely with the pharmaceutical industry and commercial compounders to bring their logistical, commercial and technical expertise to the table and to support the acceleration in production of Ready to Administer ‘off the shelf’ licensed pharmaceuticals.

Many examples of local good practice were shared with the Transformation Board. These include the work in the North of England to address the training issues in the aseptic workforce, the product standardisation work in the South West Procurement network which evolved into the 'Just do it' work and the progress towards the creation of a hub and spoke network in West Yorkshire and Harrogate. These forward-thinking initiatives need to be captured, shared and supported to create models that can be rolled out nationally.

To deliver a World leading aseptic service to support NHS patients in hospitals and at home NHS England and Improvement should:

- Work with ICSs/STPs to create the hub and spoke operating model throughout the country by 2027 to improve both service quality and cost effectiveness.

- Work with trust executives and clinical professionals to ensure the criticality of these services is acknowledged and that there is a clear and shared understanding of the governance, accountability, challenges and targets for the introduction of the hub and spoke model for aseptic medicines.

- Work with networks to develop the financial model for future services and business cases to support optimal investment in estates and equipment and on-going maintenance and renewal.

- Support collaborative developments already in progress (e.g. WYAAT) to develop blueprints for aseptic services that can be replicated in other parts on the NHS.

- Specify standardised products and formulations with their detailed specifications published and communicated to the service and suppliers. Contractual levers should be utilised to ensure that only products meeting these standards are funded NHS Specialised Commissioning Services.

- Develop and implement new longer-term contracts, monitored through key performance indicators, these should be developed with NHS and commercial compounding services. Where appropriate approaches including Open Book Contract Management (OBCM) should be further developed.

- All NHS contracts must include clear Key Performance Indicators (KPI's) that focus on standardisation, quality, service resilience and innovation.

- Work with Health Education England to create new career pathways for aseptic staff at all levels.

The implementation board members will work collaboratively across regulatory, policy and operation parts of the system to develop and obtain approval for the updated EL (97)52 quality assurance process to assure that any NHS Spoke organisations, making

aseptically produced medicines under the Medicines Act Section 10 exemption are delivering comparable quality management system controls to licenced facilities and to identify the timetable for transfer to this assurance system by 2025. It is accepted that there may need to be the one-off requirements for aseptic medicines outside these arrangements to meet immediate patient need.

The implementation board should develop relationships with potential logistics partners who already comply with MHRA guidance on temperature control together with commercial sector providers.

'Just do it!' work

During the development of this report it became clear that there were some actions that should ‘just get done’. To this end a parallel, focussed work programme with the NHS England and Improvement Medicines Optimisation Clinical Reference Group (CRG) was initiated to address the most obvious standardisation issues. The objectives include:

- Review of the NHS England and NHS Improvement dose band and product specifications to ensure they are fit for purpose and meet the needs of the end users.
- Identification of ‘quick wins’ to support the efficient supply of a focussed range of standardised chemotherapy medicines linked to the NHS Dose Banded programme.
- Promotion of national compliance with dose bands and product specifications for both in-house and outsourced compounding of chemotherapy. Promote procurement of dose banded chemotherapy from NHS licensed or commercial providers as batches as opposed to individual patient specific doses, wherever possible.
- Updating of the dose banding tables and product specifications for treatments and regimens not included in the initial programme of work.

Recommendations:

17. NHS England and Improvement to establish an NHS Pharmacy Aseptic Services transformation implementation board with formal, funded programme leadership and project management to lead and co-ordinate the programme of work.

18. The implementation board should explore potential logistics partnerships with providers who have experience of MHRA inspected fleet services (e.g. NHS blood and ambulance services who already comply with MHRA guideline on temperature control).