Chemotherapy production: Reducing patient waiting times and increasing efficiency

Provided by: Taunton and Somerset NHS Foundation Trust

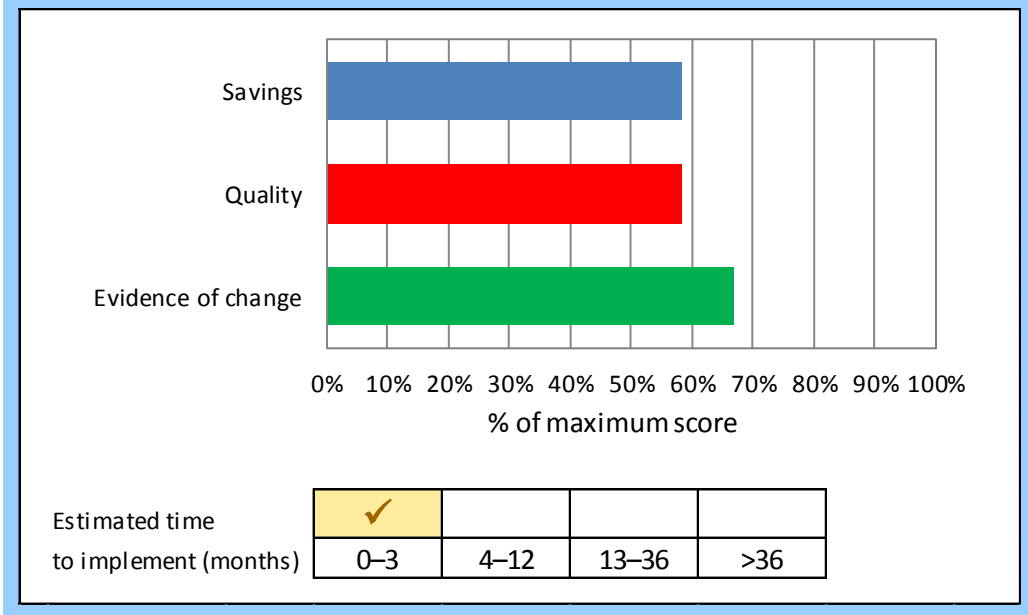
Publication type: Quality and productivity example

Sharing good practice: What are 'Proven Quality and Productivity' case studies?

The NICE Quality and Productivity collection provides users with practical case studies that address the quality and productivity challenge in health and social care. All examples submitted are evaluated by NICE. This evaluation is based on the degree to which the initiative meets the NICE Quality and Productivity criteria: savings, quality, evidence and implementability. The assessment of the degree to which this particular case study meets the criteria is represented in the summary graphic below.

Proven Quality and Productivity examples are case studies that show evidence of implementation and can demonstrate efficiency savings and improvements in quality.

Evidence summary



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Changes since the previous version

Published Quality and Productivity case studies are reviewed annually. One year after the case study has been published in the Local Practice Collection, the submitter of the case study is contacted to ask if there is further information relevant to the case study, and the case study updated as required. The case study has been amended to meet NICE style and any additional changes to this case study are outlined in the table below.

Case study section	Update
Introduction	The workload has increased by 7% per annum for the last 5 years. However the system continues to cope and capacity estimates indicate that staff will not have to be reconfigured for approximately two and a half years. Average daily prescription turnaround times continue to be 20 minutes or less.
Savings	No change.
Quality	Average daily prescription turnaround times continue to be 20 minutes or less.
Evidence	No change.
Implementation	No change.

Details of initiative

Purpose	To decrease the daily waiting times experienced by patients attending clinics for injected chemotherapy.
Description (including scope)	Musgrove Park Hospital has a 14-bed oncology ward, a 12-bed haematology ward and a chemotherapy day unit with 19 chairs. The hospital provides these services to a population of more than 500,000 people. Around 5,500 anticancer treatments are given within the trust each year, one third of which are given to haematology patients and two thirds to oncology patients. Patients are generally pre-assessed on set clinic days (for example patients with breast cancer are seen on a Tuesday and those with gastrointestinal cancers on a Wednesday), meaning that vial sharing can be used for certain high-cost agents. Dose-banding and dose-rounding are used, both through the Mosaiq integrated oncology information and electronic prescribing system. Electronic systems were introduced to help manage patient information, prescribing of medicines and clinical booking. Pre-filled bags and syringes are outsourced for a number of routinely used agents. Chemotherapy services were evaluated using common lean change management techniques such as process mapping, to identify areas of inefficiency following introduction of electronic prescribing and clinical booking. This required stakeholder involvement and agreement from those affected by the changes. Potential solutions were trialled and successful solutions were implemented. The final chemotherapy production process is as follows: 1. The clinician authorises initiation or continuation of therapy electronically. 2. A pharmacist interrogates the prescribing system and prints off all authorised prescriptions for manufacture the following day. 3. Each prescription is clinically checked by a pharmacist. 4. The checked prescription is used to prepare a production worksheet. 5. The worksheet is checked after all necessary items including drugs and sundries are gathered into a tray. This occurs in the preparation room. 6. The tray is delivered to the isolator room. 7. The regimen is prepared from the drugs and sundries contained in the tray under supervision of an accredited checking technician, who also performs in-process checks. 8. The prepared product is passed back to the chemotherapy preparation room 9. The final product is checked by a pharmacist and released for collection or delivery to the required location at the end of the production run. This final step allows the pharmacist to leave

	the production unit to perform other duties and return later to release products. This improved process resulted in: 1. A 29% reduction in staff resources required to deliver the service. 2. Approximately 90% reduction in the number of patients experiencing waits of more than 1 hour on the day of drug administration. 3. The ability to capacity plan for further expansion of the service by multiplying staffing levels and production run times. Please note that realising similar benefits will depend on the current service model and scale of activities.
Topic	End-of-life care, medicines use and procurement and productive care
Other information	The workload has increased by 7% per annum for the last 5 years. However the system continues to cope and capacity estimates indicate that staff will not have to be reconfigured for approximately two and a half years.

Savings delivered

Amount of savings delivered	There are no cash savings but staff time that can be allocated to other activities is saved. This is equivalent to 31 hours per week split across the team, comprising a pharmacist, two technicians and an assistant, equating to £30,000 per year or £8,800 per 100,000 population served.
Type of saving	Improved productivity.
Any costs required to achieve the savings	Non-recurrent resources will be required to implement lean methods. This is primarily an investment of time to undertake process mapping and analysis, planning and testing of solutions.
Programme budget	Cancers and tumours
Supporting evidence	Before-and-after data that show the benefits described above have been provided.

Quality outcomes delivered

Impact on quality of care or population health	This initiative is expected to have a slight positive effect on patient outcomes across a population as the risks associated with unauthorised prescriptions are reduced. This risk has not been quantified; however medical, production and nursing staff agreed

	that the changes were positive.
Impact on patients, people who use services and/or population safety	Risks to patient safety are reduced by ensuring all chemotherapy prescriptions are authorised before production, and that production is overseen by an accredited technician.
Impact on patients, people who use services, carers, public and/or population experience	This initiative improves the patient experience by reducing the waiting time to receive chemotherapy during visits to the clinic. The number of patients waiting longer than 1 hour at the clinic for chemotherapy reduced from around 50% to less than 5%. The average daily prescription turnaround times are 20 minutes or less.
Supporting evidence	Before-and-after data that show the benefits described above have been provided.

Evidence of effectiveness

Evidence base for case study	The initiative is based on the successful implementation of lean processes in healthcare using established tools and methods, as reviewed in Mazzocato (2010). Further details are provided in 'Contacts and resources'.
Evidence of deliverables from implementation	There has been systematic follow up and reporting of results using a before-and-after approach for several key process measures. These include the median chemotherapy production time which decreased from 4.07 hours (standard deviation = 0.52 hours) to 2.82 hours (standard deviation = 0.44 hours), and the frequency of occurrences of patients waiting longer than 1 hour for treatment, which decreased from around 50% to less than 5%.
Where implemented	Taunton and Somerset NHS Foundation Trust.
Degree to which the actual benefits matched assumptions	Efficiency gains were greater than expected.
If initiative has been replicated how frequently/widely has it been replicated	There is anecdotal evidence of similar methods being implemented for chemotherapy production elsewhere, but no systematic reporting of results is available.
Supporting evidence	Before-and-after data that show the benefits described above have been provided.

Details of implementation

Implementation details

The project was undertaken as an audit, and Ethics Committee approval was not required. Chemotherapy production staff were briefed about the project aims and the planned approach. Key personnel were recruited to a multidisciplinary stakeholder group. The directorate manager for haematology, oncology and palliative care was also briefed. Multidisciplinary meetings were arranged at key stages in the project to discuss and agree potential changes as required.

A process mapping group chaired by the chief pharmacist was established. A process map of chemotherapy production was constructed using the techniques described in Damelio (1996), to describe the journey of a single day patient chemotherapy prescription. This started at the point when the regimen was chosen and the prescription authorised, and ended when the final drug was delivered to the oncology day unit. The amount of times each step in the production process could be undertaken per unit of time was estimated, allowing the identification of bottlenecks.

Each step in the process map was scrutinised to determine why it was necessary, whether it could be done at a different time or removed from the process. The chief pharmacist acted as chair to the mapping group to facilitate this. Selected process steps were reviewed in terms of reliability and the consequences of their failure.

Several wasteful activities were identified in addition to a lack of coordination between different groups involved in the process. Potential solutions were then assessed by a stakeholder group using ‘plan, do, study, act’ testing. Successful solutions were implemented and the key performance indicators of process time and the number of patients experiencing delays were monitored.

The changes made were as follows:

1. Production runs, pre-assessment clinics and day clinic schedules were organised into a 3- or 4-day schedule: On day 1, any relevant blood tests are taken. On day 2, the patient attends pre-assessment clinic where the chemotherapeutic regimen is authorised and prescribed. Occasionally, relevant blood tests are taken during the pre- assessment clinic. On day 3 the regimen is prepared and on day 4 the patient receives their therapy.
2. CCTV remote in-process checking was replaced by an accredited checking technician present in the sterile production room.

3. Only approved prescriptions were processed.
4. Chemotherapy was prepared for the next day.
5. All activities associated with unauthorised prescriptions ceased. This included gathering cycle numbers and infusion rates.
6. Prescriptions must be authorised by 10.30am to be prepared for the following day.
7. Log book and batch numbers were largely abandoned.
8. Product labels were simplified, for example, no specific batch numbers and no infusion rates.
9. Copies of prescriptions were no longer sent to the day unit.
10. The telephone in the preparation room was re-routed.

Of the above changes, (1) and (2) had the greatest positive impact on efficiency and patient waiting times.

The final process is as follows:

1. The clinician authorises initiation or continuation of therapy electronically.
2. A pharmacist interrogates the prescribing system and prints off all authorised prescriptions for manufacture the following day.
3. Each prescription is clinically checked by a pharmacist.
4. The checked prescription is used to prepare a production worksheet.
5. The worksheet is checked after all necessary items including drugs and sundries are gathered into a tray. This occurs in the preparation room.
6. The tray is delivered to the isolator room.
7. The regimen is prepared from the drugs and sundries contained in the tray under supervision of an accredited checking technician, who also performs in-process checks.
8. The prepared product is passed back to the chemotherapy preparation room.
9. The final product is checked by a pharmacist and released for collection or delivery to the required location at the end of the production run. This final step allows the pharmacist to leave the production unit to perform other duties and return later to release products.

Time taken to implement	Approximately 3 months, including obtaining stakeholder support, planning and analysis.
Ease of implementation	This initiative involves changes in practice for oncologists, haematologists, medical staff and those involved in coordinating the process. The ease of implementation depends on the cooperation of these groups.

Level of support and commitment	Support from all affected staff is essential, but support for process reconfiguration is likely once the benefits have been explained. Patients should favour implementation as waiting times are reduced.
Barriers to implementation	Key to this project was support from the haematologists and oncologists, as changes were required in the timing of administration of clinics in relation to production runs. Cooperation was obtained first from consultants and senior nursing staff, then general nursing staff and schedulers.
Risks	The risks of adversely affecting normal daily services and the reliability of production were minimised by limiting the size and scope of individual tests of proposed solutions.
Supporting evidence	A detailed account of how this initiative was planned and implemented has been provided. Further details are available on request.

Further evidence

Dependencies	The cooperation of the chemotherapy staff, chemotherapy centre nursing and medical staff was essential.

Contacts and resources

Contacts and resources	If you require any further information please email: qualityandproductivity@nice.org.uk and we will forward your enquiry and contact details to the provider of this case study. Please quote reference 11/0029R2 in your email. Damelio R (1996) The basics of process mapping. Taylor and Francis Mazzocato P (2010) Lean thinking in healthcare: a realist review of the literature. Quality and Safety in Health Care, 19: 376-382 *Further resources:* Beard J and Wood D (2010) Application of lean principles can reduce inpatient prescription dispensing times. Pharmaceutical Journal, 284: 369–71 The NHS confederation (2006) Lean thinking for the NHS - a report commissioned by the NHS confederation. Amnis (2011) Safe and effective service improvement. Delivering the safety and productivity agenda in healthcare using a Lean

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