Using capacity planning to improve services

With decreases in healthcare spending predicted, some pundits are putting emphasis on “working smarter”. Alan Hall describes capacity planning as a management tool that relates workload, facilities, equipment and staff and explains how it can be used in pharmacy.

Pharmacy provides a range of professional services and, in many ways, it is difficult to control the demand on them. We all know that there are times when demand exceeds our capacity to provide. In these situations queues develop and patients have to wait. This can range from a short wait through to a major service reduction, depending on the extent of gap between capacity and demand. We also know that demands will fluctuate during the day and are subject to seasonal variation and this has implications for scheduling of staff.

Understanding capacity is important in helping to determine how efficient services are and when they are becoming unsafe, to monitor performance and to use resources effectively, as well as to schedule staff. It is also part of the overall NHS agenda for all healthcare professionals.

The idea of capacity planning is not new and is well developed in many sectors of the manufacturing industry. Its application in service industries and healthcare, however, is more recent.

Capacity planning has been used to examine service productivity, efficiency and safety. How many pharmacists understand what the capacity of their service is, either in part or as a whole? What would be the impact of a change in practice or a development on a service? The traditional approach would be to base a response to a change or development on a “gut feel” and past experience. This has some validity, as will be described later, but in a science-based profession the need to plan based on evidence inevitably carries more weight.

Definitions

Capacity planning is the process of determining the capacity — be it the workforce, equipment or premises — needed by an organisation to meet changing demands for its services or products and using this information to improve efficiency or plan for an impending change.

A discrepancy between the capacity of an organisation and the demands of its customers results in unserved customers or under used resources and the goal of any capacity plan is to minimise such discrepancies.

In short, capacity planning is a management tool that relates workload, facilities, equipment and staff.

Alan Hall, BPharm, MRPharmS, is director of pharmaceutical services for South Tees Hospitals NHS Trust, based at the James Cook University Hospital in Middlesbrough.

Identify knowledge gaps

1. Why might capacity planning be a useful skill for a pharmacist?
2. What data might be collected in practice to assist in capacity planning?
3. How might capacity planning improve services for patients?

Before reading on, think about how this article may help you to do your job better. The Royal Pharmaceutical Society’s areas of competence for pharmacists are listed in “Plan and record” (available at: www.uptodate.org.uk). This article relates to “effective and efficient management of pharmaceutical services” (see appendix 4 of “Plan and record”).
CONTINUING PROFESSIONAL DEVELOPMENT

- Provides facts on which decisions can be made for the effective and efficient delivery of services
- Can assist in risk management
- Can help develop the case for investment

Before any planning can begin, it is important to understand what exactly capacity is and how it can be measured. Capacity is the total output that can be produced safely with existing resources. An alternative definition sometimes used is the maximum output possible from a service over a specified period but, for pharmacy purposes, the first definition is most appropriate. In any industry operating above a full (or safe) capacity is unsustainable and only likely to be possible for a short time.

An example of a simple measure of capacity is the maximum number of prescriptions a pharmacy can dispense in a day. However, a measure that can be of more value in planning and monitoring capacity is capacity utilisation. This is the actual output as a proportion of the maximum capacity.

So, if a pharmacy has a capacity to dispense 1,000 items per day but the dispensary staff dispense only 750 items per day, the capacity utilisation is the actual output (750) divided by the maximum output (1,000), which is 75 per cent. Capacity utilisation over a day has been used as an example but any specified period can be applied.

There are two key principles to remember when embarking on capacity measurement:

- **Define your output** Output could be items dispensed, products prepared in an aseptic dispensing unit, medication histories taken or medication use reviews conducted
- **Specify your period** This could be an hour, a day, a week or longer

Whatever unit is chosen (eg, medication reviews per day) this should be used consistently. Other terms often used in capacity planning are:

- **Demand** The number of items of work from all sources and the time taken to process them
- **Activity** The number of items done and the time taken to process them
- **Backlog** The previous demand not dealt with and creating a wait or queue (eg, the number of items not dealt with and the time taken to process them)
- **Bottleneck** Any part of a system where flow is obstructed, causing delays
- **Constraint** The cause of the bottleneck

There are two sorts of bottleneck: process bottlenecks and functional bottlenecks. A process bottleneck is the stage in a process that takes the longest to complete (ie, a rate limiting step or task). Functional bottlenecks occur where processes interrelate. They stop the flow in one process while allowing flow in another process. For example, if a pharmacy does not have an accredited checking technician and the pharmacist is doing a medicines use review, this can create a functional bottleneck in dispensing.

Constraints usually involve the shortage of a skill or resource. The theory of constraints was developed by Eli Goldratt (see Resources).

**Strategy types**

Once capacity has been determined, different capacity planning strategies can be considered. The main ones are lead strategy, lag strategy and match strategy.

- **Lead strategy** If a lead strategy is chosen, capacity is added because an increase in demand is expected. For example, if a new GP surgery is to be built 200 yards from your pharmacy, you could confidently expect an increase in prescriptions. In hospital, a new clinical service can increase demands on the pharmacy service and in industry, the launch of a new product could increase production capacity to meet expected demand.

- **Lag strategy** If a lag strategy is applied, capacity is only added after the organisation has been operating at full capacity (or above) due to increase in demand. This is a conservative approach because it reduces the risk of waste, but it can be painful for the business — working flat out is hard and frustrating — and can leave many customers dissatisfied.

- **Match strategy** A match strategy involves adding to or subtracting from capacity in small amounts, as the demand changes. This strategy falls between the lead and lag approaches.

**Influencing factors**

Factors that influence capacity and its use are:

- Buildings and the space available
- Equipment
- Manpower and labour

If you can employ people to do the extra work to meet increased demand but have no space to accommodate them, your plan will be undermined. If you have plenty of space and equipment but cannot recruit the necessary staff, the result is the same.

In consideration of the effective use of resources there is also a link between capacity and fixed costs (see Panel). Fixed costs are those that do not change in relation to the output. So whether the capacity utilisation is 50 per cent or 100 per cent, the fixed costs are the same.

**Capacity utilisation and fixed costs**

If dispensary employees cost £1,000 per week and 100 per cent capacity utilisation of 5,000 items per week is achieved, your unit staff cost per item will be £1,000/5,000 = £0.20

If they dispense only 3,500 items in a week (ie, capacity utilisation of 70 per cent) the unit staff cost per item will be £1,000/3,500 = £0.29

When capacity utilisation is high the fixed costs are spread over more units and the cost per unit is low. When capacity utilisation is low the fixed costs are spread over fewer units and the cost per unit rises.
At first glance it might appear that the ideal capacity utilisation would be 100 per cent because this would give maximum efficiency and profit. The advantages are that the fixed costs borne by each unit of output are at the lowest level possible. It gives the most effective use of the available resources and the service can be seen as productive and successful. But there are real problems with operating at maximum capacity. First, there is no flexibility to deal with variation in demand and if demand suddenly increases the impact on the service could be severely damaging. Second, staff working at maximum output levels are far more likely to suffer illness and stress. Thirdly, a service operating at maximum capacity has no time for planning, reviews, change or improvement. Moreover, there is no time for staff training and safety may be compromised.

As a general rule, when a service is operating close to or above capacity investment is needed in that service. There will be a need to change one or more of the resources producing the output. This could be buildings or equipment, but for many pharmacy services, more likely, manpower.

Examples of capacity planning in pharmacy

One of the most well known pharmacy capacity planning models was developed for the production of cytotoxic drugs in aseptic dispensing units by the NHS Cancer Services Collaborative.1

As stated, within any model it is first necessary to define the measure of output. This could be a simple count of the number of items produced but, in the case of chemotherapy regimens, this fails to recognise the variety of products used and the associated time for preparation. So in the national model factors are applied to score each item in terms of complexity. For example, simply drawing up an item into a syringe is counted as one item, but if a product must be mixed, drawn up into a syringe and then transferred to an infusion bag, this is counted as three items. The model has eight steps:

1. Understand how long it takes to prepare each item and calculate an adjusted item rating.
2. Estimate the fixed time required per session of work (eg, cleaning the isolator, changing the gloves). These are fixed and unrelated to the number of items prepared.
3. Estimate the fixed time required for any processes involved in addition to the preparation time (eg, checking the prescription, preparing the worksheet and label, setting up the ingredients).
4. Estimate the total time required for the general running of the unit (eg, procedure writing, training).
5. Calculate the number of items (using the adjusted rating) prepared in one month (data collection should be repeated for three months if possible).
6. The model has an equation to calculate the amount of time required by each staff group involved in the process and the workload figures are put into this equation.
7. Calculate how much time there is available from the staff you have, remembering to make allowances for holidays and sickness.
8. Compare the staff time available (step 7) with that calculated to do the work in order to obtain the current capacity position.

This model looks at the constituent steps in the overall process of chemotherapy preparation. It estimates timings for those steps for different staff groups, examines the current workload and compares the output with the maximum possible from the existing resources. With all this information, a robust plan can be made. Other models for aseptic services have also been published2,3 but it is possible to develop capacity plans for all aspects of pharmacy services by selecting a service and considering the following:

- What are the measurable outputs of the service?
- What are the steps in the process?
- What data will need to be collected? (And has it already been collected for other purposes or how can it be collected?)
- Are any assumptions to be made in order to simplify the task but still develop a realistic plan?

A model of such detail as the one already described may not be needed in all instances to produce a capacity plan, depending on your purposes. It is valid to make assumptions as long as these are stated clearly and to use estimates of time, based on experience and collective intelligence, instead of accurately timing every step for every staff member (a throwback to the days of time and motion studies were used to look at business efficiency). A simple plan such as described by Steve Acres, pharmacy service manager at University Hospitals of Leicester (PJ, 7 August 2004, p184), can suffice for internal use as a monitoring tool for performance and efficiency, but if the purpose is to support an investment in a service, a more comprehensive model is likely to be needed because more detail may be asked for by those holding the purse strings.

The aim of any capacity planning is to match relevant capacity to demand. All the models discussed include key steps that should feature in all capacity plans. First, the process must be defined. It should have a clear scope (where does it start and finish?) and identify all the different staff involved at each stage. The process should also be carefully mapped, which is often best done with people involved in it. If possible, identify any bottlenecks and the potential causes of them. Goldratt’s theory of constraints advises measuring demand, capacity, backlog and activity in the same units at the bottleneck. Then redesign the process to match demand and capacity. If you want to solve the problem, concentrate on managing bottlenecks by making changes to reduce demand, increase capacity, or manage variation (peaks and troughs). For example, a repeat prescription collection service could be organised so that collections are made from surgery A on one day and from surgery B on the next, rather than from both surgeries on the same day. However,
Continuing Professional Development

CONTINUING PROFESSIONAL DEVELOPMENT

The idea of engaging in capacity planning as part of a pharmacist's continuing professional development may seem strange. Pharmacists have a duty to their patients, their colleagues and the NHS to provide safe and effective services. They should understand how to measure outputs and determine capacity utilisation as aids to monitoring performance, forward planning for service development, scheduling of staff and managing risk. There is also a relationship between capacity planning and financial control of service costs.

There are some well validated models that can be used for specific services but pharmacists should not underestimate the power of their understanding of services they provide and, using that knowledge, they can make valid estimates of capacity utilisation by defining the scope of any service and allocating times to the service process steps. This can be cross-checked with colleagues to ensure that any assumptions made about the processes are justified and time estimates realistic.

As Mr Acres wrote in his article: “We all have a responsibility to support our staff and ensure that sufficient resources are available to meet demand and reduce the risk to patients.” We are often so busy delivering services that we fail to take time to look at their effectiveness or to plan for the future. Capacity planning provides useful tools to undertake these activities. How often are we asked the question about pharmacy resource needs associated with service developments? The answer is usually required urgently with little time for thought but if there is information available on the existing use of resources giving an understanding of the use of capacity the answers are more realistic than “think of a number and double it”.

References
4. Purkiss R. How to get the staff you need, calculation of pharmacy manpower requirements. Pharmacy in Practice 1997;103–6.

Action: practice points
Reading is only one way to undertake CPD and the Society will expect to see various approaches in a pharmacist’s CPD portfolio.
1. Examine the services provided in your area of work and determine if you can establish the maximum output of a service with the existing resources?
2. Discuss with colleagues how you are using your capacity for that service. Do the capacity utilisation data give you any cause for concern?
3. Produce an estimate of manpower resource required for a possible service development.

Evaluate
For your work to be presented as CPD, you need to evaluate your reading and any other activities. Answer the following questions:

What have you learnt?
How has it added value to your practice? (Have you applied this learning or had any feedback?)
What will you do now and how will this be achieved?