

Benefits of a dedicated cystic fibrosis pharmacist

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The Manchester Adult Cystic Fibrosis Centre (MACFC) moved in 1994 from North Manchester Hospital to a purpose-built facility at Wythenshawe Hospital with 140 adult patients with cystic fibrosis (CF). By 2003 there were 250 patients attending the MACFC. As the life expectancy of CF patients increases so does the complexity of their disease and their medication regimens. The complexity and cost of such regimens demand a major pharmaceutical care input for these patients. Prior to 2001 pharmacy services were delivered to the MACFC through a traditional organization based in a central pharmacy which also provided pharmacy services to 39 wards, 700 beds, 57 498 inpatient admissions and 251 246 consultant-led outpatient attendance appointments each year. In 2001 a dedicated CF pharmacist was appointed as part of the multidisciplinary team. The CF pharmacist is located in the MACFC and responsible operationally to the CF Clinical Director and professionally to the Director of Pharmacy.

THE BENEFITS OF A DEDICATED CF PHARMACIST

The benefits of the dedicated CF pharmacist (after 2 years in post) can be summarized as:

- discharge medication availability time reduced by 84%
- improvement in accuracy of communication between secondary and primary care
- pharmaceutical input at the point of prescribing
- reduction in medication errors
- improvement in effectiveness by optimizing medicines usage in these patients
- fewer dispensing queries
- medication cost-savings
- improved tobramycin monitoring
- better use of resources
- cost savings in central intravenous additives
- audit.

OBJECTIVES

The CF Clinical Director considered that the purchase of a dedicated pharmacist would provide potential benefits in five areas. These objectives would include the guidelines for a specialist CF Pharmacist as documented by the CF Trust.¹

Table 1 Errors on discharge summaries

Written on discharge summary	Intended	Comments
Ethanol	Ephynal	
Seretide inhaler 250	Seretide Accuhaler 250	Different dose of Salmeterol
Totalin 1 mg bd	Tolterodine 1 mg bd	
Omeprazole 40 mg bd	Omeprazole 20 mg bd	
Feroxetine 20 mg od	Paroxetine 20 mg mane	
Humulin mixtard 50	Humalog Mix 50	
Humalog mix 25	Humulin I	
Seretide 100 1p bd	Seretide 500 acc 1p bd	
Itraconazole 100 mg bd	Itraconazole 200 mg bd	Sub-therapeutic dose
Dnase 2.5 mg bd	DNase 2.5 mg od	Sometimes increased to bd during admission
Verapamil	Ramipril	

bd, twice a day; od, once daily; mane, in the morning; p, puff; acc, accuhaler

The five areas, which are discussed in detail below, are: the primary/secondary care interface, in-patient services, outpatient services, the multidisciplinary team and cost-effectiveness.

Primary/secondary care interface

Much work is needed to smooth the primary/secondary care interface and CF is no exception. Information given to general practitioners (GPs) is crucial to optimal care. The number of medicines given to CF patients is considerable and changes over time are common. It is therefore vital that these changes are communicated accurately to GPs. Much of the information that GPs require to continue prescribing to CF patients is included in the discharge summary. Accuracy of the discharge summary is therefore crucial. The CF Clinical Director recently requested that the dedicated CF pharmacist check the medication section of the discharge summary and its compliance with the discharge prescription. The CF pharmacist reviewed a total of 118 discharge summaries and checked drugs, dose, completeness, inaccurate inclusions and any spelling mistakes where this could result in misinterpretation by the GP surgery. Ninety-two per cent of summaries were found to have one or more

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Table 2 Omissions on discharge summaries

Omissions	Comments
Common omissions	
Colistin	Therapy not continued in hospital
Diluents	
Short-acting B ₂ inhalers	PRN on medicine kardex or not at all therefore missed on TTO
Creon	PRN on medicine kardex

PRN, whenever necessary; TTO, to take out

errors in the medication section, examples of which are shown in Tables 1 and 2. Examples of other omissions: Humalog Mix 50; Tranexamic Acid; Montelukast. As a consequence of discovering the high levels of errors the discharge summary process was reviewed.

A new system was piloted which involved the dedicated CF pharmacist writing the discharge prescription to ensure completeness and accuracy. A copy of the discharge prescription was then given to the clerical assistant who had responsibility for transcribing the information onto the medicine section of the discharge summary. The audit of accuracy within the discharge summaries was repeated and the medication errors were observed to have been completely eliminated.

The pilot scheme has subsequently been implemented on a permanent basis.

Communication with community pharmacists

In an attempt to improve communication between the dedicated CF pharmacist and the community pharmacists who are responsible for supply of medication in primary care, a business card was produced and circulated to all patients. They were asked to hand this card to their community pharmacist and to invite them to contact the dedicated CF pharmacist if they had any queries or problems with the patient's medication as prescribed by the CF centre.

IN-PATIENT SERVICE

Benefits to the discharge process

Patient discharge times have been reduced following the introduction of a Patient's Own Drugs (POD) scheme, a one-stop dispensing scheme in which the CF pharmacist writes the discharge prescription. The Trust was piloting a POD scheme within the hospital and this was introduced to the CF ward shortly after the appointment of the dedicated CF pharmacist.

The POD scheme in the CF centre has the following features:

- Patients are requested to bring their own medication into hospital
- Patient medication is then stored in a locked cupboard within the patients' room
- Any medication that needs to be supplied is issued to that patient, labelled with the directions for use and the patient's name (one-stop dispensing)
- The nurses hold a master key for all the boxes on the ward but patients can have a key to their own box if they wish to self-medicate and have been assessed as suitable candidates

The POD scheme enables the patient discharge process to be much quicker since most of the drugs that the patient requires are readily available from the patient's cupboard and the CF pharmacist can quickly write the discharge prescription without recourse to a doctor. (The dedicated CF pharmacist was authorized by the CF Clinical Director to write discharge prescriptions as discussed above.) Not only are there improvements in the accuracy of prescribed medicines and a reduction in errors but the POD scheme has been shown to have good potential for cost-savings. The POD scheme on the CF ward was audited by pharmacy and cost savings of £2845 in 1 week were identified. The audit weeks were chosen by the pharmacy department and all medication brought in by patients from home was identified and costed. The savings accrue when intravenous antibiotics that have been prescribed for use at home are brought into the hospital and used to treat that patient. Previously medication would have been dispensed from the pharmacy.

The writing of discharge prescriptions by the CF pharmacist together with the POD scheme has resulted in a patient's medication being ready within half an hour of the decision being made to discharge. This time frame includes patients who are going home on intravenous antibiotics. Previously there was a considerable time delay between the prescription being written and the medicine being dispensed and transported to the wards. The average time to turn round a typical hospital discharge prescription in the main pharmacy department is 3 h at South Manchester University Hospital Trust. Taking into account the additional time taken for the doctor to write the prescription and for the pharmacy porter to deliver the medicines to the ward, the advantages of the new system are obvious.

Patient counselling

All discharge patients are counselled about their medication by the dedicated CF pharmacist and offered a medicine reminder chart which lists all their medication, the purpose and the timing. The dedicated CF pharmacist

can affect medication costs through improved communication with discharge patients. The opportunity is taken by the CF pharmacist to discuss with each patient his or her precise circumstances regarding their supply of home medicines. This enables the supply given from the ward to match the amount required more precisely. This is particularly valuable where the patient is going on holiday and requires extra supplies or where the patient has a good stock at home and thus requires fewer drugs to be supplied. This allows a potential saving in expensive drugs that contributes to the cost-effectiveness of the CF pharmacist's post.

Patient and nursing staff appreciation

Both the nursing staff and the patients appreciate the new discharge system. Some comments from the patients are:

It's great not to have to wait for hours for my medicine to come from pharmacy

Fantastic, because I can get off before the motorway gets busy

I can arrange for my family to come and know that my medicines will be ready—they used to have to wait for ages

I can get to the pub quicker.

And from the nurses:

The discharge process has not just been smoothed it has been revolutionized. It takes away the hassle in two ways. Firstly, from patients who are constantly demanding to know how long their TTOs will be from pharmacy and, secondly, the queries from pharmacy about medication with which they are not familiar

[under the previous system] I had four phone calls from pharmacy querying one TTO

When you [the CF pharmacist] are on holiday it takes ages.

Junior doctors, in their informal exit interviews at the end of their 6-week rotation in the CF centre, without exception valued the input of the CF pharmacist and felt their workload had been reduced. This can obviously contribute to the national requirement for reducing junior doctors' working times.

Short patient leave

The POD scheme facilitates day/weekend patient leave since all the medication is ready to take home and then bring back on re-admission. This can replace the unacceptable practice of unchecked medicines being issued to patients from ward stocks.

Resource efficiency

Discharge medicines being supplied in this timely manner ensures that the room of a discharged patient becomes available for the next admission sooner. Elective admissions can be admitted earlier, allowing the whole CF multi-disciplinary team, including those disciplines that normally cover day shifts, to assess the patient on the day of admission. This can contribute to improvements in access targets.

Validation

It has not been possible to carry out a longitudinal study of the impact of the dedicated CF pharmacist on discharge times to validate the improvement in discharge time. However, when the CF pharmacist is on holiday the system reverts to the situation before the creation of the post and this provides a glimpse of the conditions that prevailed during the previous system. An audit was consequently carried out during a recent holiday of the CF pharmacist and this showed that patients waited an average of 4 h for their medication from the central pharmacy, compared with half an hour when the CF pharmacist is present.

The downside of removing improvements, even temporarily, is that patients have come to expect a continuous high standard of care. The long wait for discharge medicines during the pharmacist's holiday occasionally presented a problem as some patients were not prepared to wait longer than they were used to and left without their take-home medication.

Further advantages

Another advantage of the POD scheme is that it gives some insight into compliance with therapy. The CF pharmacist can observe the prescription dispensing date on the medication box brought in by the patient for POD and hence gain a view of the rate of home usage relative to that intended. Interestingly an examination of medicines brought in by patients has also highlighted some mistakes in therapy, examples of which are shown in Table 3.

Tobramycin monitoring

In addition to having an impact on in-patient discharge times a dedicated CF pharmacist can become more involved in monitoring medications. One example that has helped in-patients concerns the monitoring of blood tobramycin levels.

The CF centre protocol stated that levels were to be monitored only after the third dose unless a problem with renal function was identified. However, the Specific Product Characteristic (SPC)² recommends monitoring every 3–4 days. An audit was performed to assess whether the existing level of monitoring was sufficient. Tobramycin

Table 3 Examples of errors identified

Patients' own medication	Medication intended by CF centre	Comments
Seretide accuhaler 100	Seretide accuhaler 500	1/5 dose fluticasone
Calcichew	Calcichew D ₃ Forte	No vitamin D in preparation
Slow k	Slow sodium	Potassium supplementation instead of sodium
Omeprazole 20 mg daily	Omeprazole 20 mg bd	Incorrect dose
Clarithromycin 500 mg daily	Clarithromycin 500 mg bd	Incorrect dose
Human mixtard 50 insulin	Humalog mix 50	Incorrect insulin

bd, twice a day

levels were taken after the third dose and again in the second week during the audit. The audit period was intended to be 3 months but it was clear after monitoring 45 patients that a number of serious errors had been clearly identified:

- Levels were not being reported as having a peak range, since they were only stated as <10 mg/L. As a consequence doses were not being increased into the therapeutic range. The audit found that 48% of patients did not achieve therapeutic levels during their admission and were thus under-treated.
- No procedure was in place for levels which needed to be repeated because of insufficient sample or similar problems
- No one was taking responsibility for the whole sequence
- In some instances levels were not requested after the third dose.

As a consequence of the audit results the CF pharmacist has now assumed responsibility for both in-patient tobramycin monitoring and any follow-up action using the following system:

- requesting levels
- monitoring results
- in conjunction with the junior doctor, ensuring that doses are adjusted and re-tests requested as necessary
- ensuring that the report form has been amended to include a range for peak dose reporting.

Exit interviews with rotational junior doctors confirm that they appreciate the pharmacist taking responsibility for tobramycin monitoring.

Reduction in wastage of central intravenous additives (CIVAs)

Since the CF pharmacist is now resident on the unit and attends ward rounds any changes in CIVAs, problems encountered and discharges can be quickly acted upon to reduce wastage. If a decision is made to change an antibiotic or to discharge a patient this can be quickly communicated to the central pharmacy aseptic unit so the order can be cancelled or changed. Given the high costs of the antibiotics used in CF this can result in considerable savings. Whilst it has not been possible to carry out a longitudinal study before and after the appointment of a dedicated CF pharmacist, the situation when the CF pharmacist is on holiday has been compared with that upon the pharmacist's return. It was found that CIVA wastage per week with the dedicated CF pharmacist was £30 compared with £324 without the CF pharmacist. The potential annual saving on CIVAs is therefore £16 848.

Input into the ward round

A dedicated CF pharmacist can contribute to ward rounds in various ways:

- advice can be given to doctors at the point of prescribing
- pharmaceutical problems that are raised by the multi-disciplinary team can be quickly and directly addressed
- the CF pharmacist can ensure that any changes to medication are documented on the medicine kardex and that the long-term medication records are updated.

Maintaining supplies

A dedicated CF pharmacist can devote more time to medication supply issues. This has shown to benefit the CF centre when over the last 2 years there have been significant shortages of a number of key CF medications. Through close liaison with purchasers and manufacturers a constant supply of tobramycin and intravenous ciprofloxacin has been maintained, the impact of limited supplies of Tazocin was minimized, and other formulations of vitamin E were identified, purchased and supplied to the patients.

To summarize, a dedicated CF pharmacist can have a positive impact on in-patient care in terms of much reduced discharge times, the freeing up of junior doctors for other duties, less frustration, less waste, more savings, better monitoring and improved therapy.

OUT-PATIENT SERVICES

Annual assessment

Whilst much has been published regarding annual reviews for CF patients^{3,4} most CF centres do not include a pharmacist in the process. However, pharmacists are

conducting medication reviews in primary care and the same principles⁵ were adopted by the dedicated CF pharmacist, who coincidentally worked one session per week for a local general practice and consequently had some relevant experience.

These principles have been adopted in the following ways:

Medication review with the patient

All medication is reviewed for appropriateness, efficacy and interactions. Patient knowledge of medication is additionally ascertained and education provided where necessary. It should be noted, however, that this has not been shown to increase concordance in these CF patients.⁶ This is particularly important as there is limited time for continuing medication reviews by other members of the multidisciplinary team in busy out-patient clinics.

Medication history discussion with the patient

A complete medication history is taken to include any recreational drugs, over-the-counter medications and herbal remedies, and advice is given regarding side-effects, appropriateness and interactions with conventional medicines. The discussion also allows the pharmacist to establish more detailed information regarding allergies and intolerances to medicines.

Monitoring and formulation

Any necessary monitoring or assessment of levels can also be organized, and any formulation problems resolved. The latter include consideration of medication alternatives, changing from solid to liquid preparations, and the supply of tablet cutters or crushers if appropriate. An assessment can also be made of the suitability of any medication for a compliance aid, and this may be supplied if potential benefit is anticipated.

Supply issues (primary/secondary interface)

Patients are asked if they experience any problems obtaining their medication, either prescriptions issued from the general practitioner or supplies from their community pharmacist. To aid continuity of care the CF pharmacist addresses any such problems.

Medicine reminder chart

A chart is supplied to each patient that includes (for all medication) the purpose, timing and dosage. Timing is agreed with the patient to suit their needs and to avoid any concomitant administration which might impair absorption.

Adherence

Patients are asked to assess their own adherence to therapy. For some items this is compared with prescriptions

requested from their general practitioner as an independent measure of compliance. More effort can then be made to counsel those patients who are clearly overestimating their own compliance.

Multidisciplinary team annual feedback discussions

Shortly after an annual review has taken place, the multidisciplinary team meets for a feedback discussion. During this meeting the dedicated CF pharmacist can make suggestions to the team regarding any changes, alternatives or additions to therapy. These changes to therapy, if accepted by the team, are communicated to the general practitioner.

The annual assessment discussion with the patient is designed to address some issues of unintentional non-compliance⁷ including:

- the patient's ability to take medication
- lack of knowledge of medicines
- unawareness of instructions for use and forgetfulness.

Feedback to the general practitioner

A comprehensive list of medication for each CF patient is sent to the general practitioner. This is of particular importance for those CF patients who are never admitted to the ward since this will be the only complete record that a practice will have to ensure that their repeat medication record is accurate.

Dispensing and clinical checking within the CF centre

A limited facility for dispensing has been set up in the CF clinic. The obvious advantage of this to the patient is that it reduces waiting time compared with dispensing by the more remote main pharmacy. Since these limited prescriptions will be supplied by the dedicated CF pharmacist, who has more detailed knowledge and experience of CF medications, the number of queries relating to the prescriptions is minimized. It also ensures that counselling is given directly to patients regarding side-effects, interactions, timing, and other issues such as the possible reduction of the effectiveness of the oral contraceptive pill by antibiotics.

The facilities for dispensing on the unit are limited. Nevertheless the remaining medication item prescriptions can be clinically checked by the dedicated CF pharmacist before being taken to the main pharmacy. This speeds up the process in the main pharmacy by ensuring completeness, legibility and the minimization of drug interactions.

Whilst limited, this local dispensing service has been very well received by those patients who benefit. However, it is not available for every clinic and this has been a comment on the patient equality questionnaire.

Patients also appreciate access to a knowledgeable CF pharmacist and some patients now make requests to see the CF pharmacist for medication advice during clinic visits.

MULTIDISCIPLINARY TEAM

The presence of a dedicated CF pharmacist ensures that multidisciplinary collaborations are more readily facilitated, since the pharmacist is based in the clinic and on the ward as opposed to the pharmacy. The pharmacist therefore has the opportunity to focus closely on CF-related issues.

Some examples of multidisciplinary collaboration are:

- production of Patient Group Directions⁸
- production of Shared Care Protocols to enable medication to be supplied in primary care⁹
- applications to the Medicines Management Committee for new treatments
- scheme, in conjunction with the specialist nurses, to reduce wastage of prescribed intravenous medication.

Junior doctors, nurses and patients have voiced their appreciation of help received from the pharmacist with medication issues relating specifically to CF and the advantages of having a ward/clinic-based pharmacist.

COST-EFFECTIVENESS

Although optimal patient care must never be compromised in any cost-saving exercise, it is important that wastage be kept to a minimum. A dedicated CF pharmacist can focus on the waste aspects of medication whilst maintaining patient care levels. Wastage reduction in CIVAs has been identified above, as have the cost savings with the POD scheme.

Further cost savings have been pursued by the dedicated CF pharmacist through a focus on those medications that can be dispensed in community pharmacies. For example, the pharmacist writes FP10 (hp) prescriptions (prescriptions written in hospital and dispensed in the community) for expensive medication in order that they can be dispensed through a community pharmacy to avoid paying value added

tax (VAT). Prescriptions dispensed in the community are free of VAT whereas those dispensed in the hospital include the tax. Hospitals are not in a position to pass on VAT to clients. Also, by liaising closely with primary care pharmaceutical advisors agreement has been reached for some patients to have nebulized antibiotics prescribed in primary care.

CONCLUSIONS

The benefits of a dedicated CF pharmacist have been described in terms of financial savings, patient care improvement, more immediate advice and input to the CF multidisciplinary team, raised documentation accuracy, an improved primary care interface, more consistent medication monitoring and resource efficiency. It is hoped that the details and discussion will provide a benchmark for other CF units to obtain a full-time dedicated CF pharmacist. The employment of such a pharmacist allows specialization and better focus in a discipline with a high need for pharmaceutical input.

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