

# Prescription of diuretic drugs and monitoring of long-term use in one general practice

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**SUMMARY.** A cross-sectional survey of the prescription and monitoring of diuretic drugs for long-term use was performed in a Nottinghamshire training practice, which has 7619 patients. It was found that 330 patients were long-term users of diuretic drugs, with 79% of these patients aged 60 years or over. Twenty three different diuretic drugs were prescribed with a total cost of £13 643 per year. A few drugs accounted for a disproportionate amount of the total cost, with combination diuretic drugs being particularly expensive. The most common indications for the prescription of diuretic drugs were hypertension and congestive cardiac failure. General practitioners initiated the prescribing of diuretic drugs in 87% of cases, with only a small proportion being prescribed by hospital doctors. One third of the patients had no record of urea and electrolyte levels in their notes after commencing treatment with a diuretic drug.

On the basis of these findings recommendations are made for the initiation and monitoring of the long-term use of diuretic drugs.

**Keywords:** drug long term use; diuretics; drug monitoring; prescribing audit.

## Introduction

DIURETIC drugs have undoubted benefit in various common medical conditions and form one of the largest groups of prescribed drugs in general practice, accounting for considerable expenditure by the National Health Service. They are prescribed to between one quarter and one third of elderly patients<sup>1,2</sup> and the side effects from these drugs in this age group<sup>3-5</sup> are a leading cause of iatrogenic illness.<sup>6</sup> All doctors selecting and prescribing a diuretic drug must make a judicious choice bearing in mind clinical benefit, side effects and cost.

This paper describes a study of the prescription and monitoring of diuretic drugs for long-term use in one general practice with a higher than average proportion of elderly patients. The objectives of the study were to identify which diuretic drugs are prescribed for long-term use; to calculate the cost of these drugs; to identify the reasons for their initiation and who initiated them; to examine how they are monitored; and to recommend policies for initiation and monitoring.

## Method

The study was performed in the autumn of 1987 in a four handed general practice in Radcliffe-on-Trent, a retirement area and commuter village 13 miles outside central Nottingham. The practice cares for 7619 patients with 1404 (18.4%) aged 65 years and over and 648 (8.5%) aged 75 years and over; the figures for England and Wales are 18% and 4%, respectively (Office of Population Censuses and Surveys, 1987).

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## Collection of data

All diuretic drugs prescribed for repeated long-term use were identified by reviewing requests for repeat prescriptions. For each drug the practice computer provided a list of patients receiving the drug together with dates of births. All notes were retrieved and reviewed. For each patient the date of the first prescription of the particular diuretic drug concerned was recorded. This did not necessarily reflect when the patient had first received a diuretic drug of any kind as the prescription of some patients had been changed. A note was made of the initial indication for the prescription of a diuretic drug and whether the treatment had been started by a general practitioner or a hospital doctor. Hepatic or renal disease and concurrent use of steroids or digoxin were noted as these might influence the prescribing of diuretic drugs because of potential electrolyte disturbances or drug interactions.

## Cost of diuretic drugs

The lowest price quoted in the *British national formulary* (number 15, 1988) was used in conjunction with individual recorded dosage to calculate the monthly cost of each diuretic drug.

## Results

A total of 330 patients, 4.3% of the total practice population, were long-term users of a diuretic drug. Of these patients 78.8% were aged 60 years or over (Table 1).

## Type and cost of drugs

Seven patients were receiving two different diuretic drugs. There were, therefore, 337 repeat prescriptions. The types of diuretic drugs prescribed and their cost are shown in Table 2. The total monthly cost was £1136.90.

Loop diuretic drugs with or without a potassium-sparing diuretic drug and thiazide diuretics with or without potassium were the most commonly prescribed diuretics. The major drug expenditure among the loop diuretic drugs was on *Frumil*. Within the thiazide diuretic and thiazide diuretic plus potassium group indapamide was prescribed in only 10 cases (8.1%) but was responsible for 67.7% of expenditure. On the other hand, bendrofluazide was prescribed in 67 cases (54.5%) but accounted for only 5.9% of expenditure. Beta blockers and diuretic combination preparations accounted for a disproportionately large proportion of the total monthly cost. A large part of their expense is due to the beta blocker component.

**Table 1.** Age of long-term users of a diuretic drug.

| Age (years) | % of long-term users of a diuretic drug (n = 330) |
|-------------|---|
| 30-39       | 1.5   |
| 40-49       | 6.1   |
| 50-59       | 13.6  |
| 60-69       | 27.3  |
| 70-79       | 27.6  |
| 80+         | 23.9  |

n = total number of long-term users of a diuretic drug.

Table 2. Long-term diuretic drugs prescribed and their cost (proprietary formulations are given in *italic type*).

| Diuretic drug   | Number (%) of repeat prescriptions | Cost per month (£) (% of total) |
|---|------------------------------------|---------------------------------|
| <b>Loop diuretics</b>                                       |                                    |                                 |
| Frusemide   | 23                                 | 21.26                           |
| <i>Lasix</i>  | 3                                  | 3.20                            |
| Total   | 26 (7.7)                           | 24.46 (2.2)                     |
| <b>Loop diuretics with potassium</b>                        |                                    |                                 |
| <i>Burinex K</i>  | 13                                 | 21.68                           |
| <i>Diumide-K Continus</i>                                   | 9                                  | 18.09                           |
| Total   | 22 (6.5)                           | 39.77 (3.5)                     |
| <b>Loop diuretics with a potassium-sparing diuretic</b>     |                                    |                                 |
| <i>Frumil</i>   | 79                                 | 412.60                          |
| <i>Lasilactone</i>  | 1                                  | 5.40                            |
| Total   | 80 (23.7)                          | 418.00 (36.8)                   |
| <b>Thiazide diuretics</b>                                   |                                    |                                 |
| <i>Aprinox</i>  | 1                                  | 0.20                            |
| Bendrofluzide   | 67                                 | 5.09                            |
| Indapamide  | 10                                 | 58.65                           |
| Xipamide  | 1                                  | 2.93                            |
| Total   | 79 (23.4)                          | 66.87 (5.9)                     |
| <b>Thiazide diuretics with potassium</b>                    |                                    |                                 |
| <i>Brinaldix K</i>  | 1                                  | 1.65                            |
| <i>Navidrex-K</i>   | 39                                 | 16.83                           |
| <i>Neo-NaClex-K</i>   | 4                                  | 1.32                            |
| Total   | 44 (13.1)                          | 19.80 (1.7)                     |
| <b>Thiazide diuretics with a potassium-sparing diuretic</b> |                                    |                                 |
| <i>Aldactide 25</i>   | 4                                  | 23.03                           |
| <i>Moduret 25</i>   | 2                                  | 4.16                            |
| <i>Moduretic</i>  | 18                                 | 48.60                           |
| Total   | 24 (7.1)                           | 75.79 (6.7)                     |
| <b>Potassium-sparing diuretics</b>                          |                                    |                                 |
| Amiloride   | 5                                  | 13.14                           |
| Spironolactone  | 7                                  | 12.15                           |
| Total   | 12 (3.6)                           | 25.29 (2.2)                     |
| <b>Beta blockers with a thiazide diuretic</b>               |                                    |                                 |
| <i>Kalten</i>   | 8                                  | 107.67                          |
| <i>Lopresoretic</i>   | 3                                  | 19.39                           |
| <i>Prestim</i>  | 1                                  | 8.40                            |
| <i>Tenoretic</i>  | 31                                 | 255.09                          |
| <i>Trasidrex</i>  | 7                                  | 76.37                           |
| Total   | 50 (14.8)                          | 466.92 (41.1)                   |
| <b>Total</b>  | <b>337</b>                         | <b>1136.90</b>                  |

### Initiation of diuretic treatment

General practitioners had commenced the diuretic treatment in 293 of the 337 prescriptions (86.9%). Only eight different diuretic drugs (44 prescriptions) were started in hospital — *Frumil* (13 prescriptions), frusemide (seven) and bendrofluzide (five) were the most common. The indications for initiating a diuretic drug are listed in Table 3. Congestive cardiac failure and ankle oedema were the most common indications for prescribing loop diuretics with and without potassium and with a potassium-sparing diuretic (71/128, 55.5%), while hypertension was the most common indication for thiazide diuretics with or without potassium (90/123, 73.2%) and for beta blocker and diuretic combination preparations (49/50, 98.0%). All 10 prescriptions of indapamide had been initiated between 1980 and 1982 — eight in 1980.

### Monitoring

For 76 of the 330 patients (23.0%) there was no record of urea and electrolyte levels in their notes. Thirty six patients (10.9%)

Table 3. Indications for initiating a diuretic drug as recorded in the patients' notes.

| Indication                           | Number (%) of prescriptions (n = 337) |
|--------------------------------------|---------------------------------------|
| Hypertension                         | 155 (46.0)                            |
| Congestive cardiac failure           | 52 (15.4)                             |
| Ankle oedema                         | 45 (13.4)                             |
| Shortness of breath                  | 12 (3.6)                              |
| Shortness of breath and ankle oedema | 7 (2.1)                               |
| Basal lung crepitus                  | 4 (1.2)                               |
| Breast swelling                      | 4 (1.2)                               |
| Leg oedema                           | 4 (1.2)                               |
| Pre-menstrual syndrome               | 4 (1.2)                               |
| Hypertension <sup>a</sup>            | 3 (0.9)                               |
| Pleural effusion                     | 3 (0.9)                               |
| Weight reduction                     | 3 (0.9)                               |
| Carpal tunnel syndrome               | 2 (0.6)                               |
| Hypercalcaemia                       | 1 (0.3)                               |
| Tachycardia                          | 1 (0.3)                               |
| Thrombophlebitis                     | 1 (0.3)                               |
| Miscellaneous                        | 3 (0.9)                               |
| Unclear from notes                   | 26 (7.7)                              |
| Notes not available                  | 7 (2.1)                               |

n = total number of prescriptions for a diuretic drug. <sup>a</sup>With congestive cardiac failure, ankle oedema or shortness of breath.

had urea and electrolyte levels measured prior to starting to take a diuretic drug but not subsequently. Sixty six patients (20.0%) had results recorded within the past year and 47.9% had results recorded within the past four years.

### Concomitant illnesses and drugs.

Two patients had marked liver disease and one of these was taking a combination preparation containing a potassium-sparing diuretic drug. Twenty nine patients (8.8%) were also taking digoxin and four were regularly taking steroids. Six of those patients taking digoxin and one of those taking steroids were not taking a diuretic containing a potassium supplement or a potassium-sparing diuretic.

### Discussion

There are two major limitations to this study. First, it was performed in one general practice and reflects the prescribing habits of only four doctors in an area with a high proportion of people over 75 years old. Secondly, data were collected retrospectively and were not therefore complete. Despite these limitations important conclusions can be drawn which have implications for other practices.

Indications for prescribing a diuretic drug were recorded in almost all of the notes and were valid. In a small proportion of the notes the indication was not clearly stated making it difficult to decide whether treatment should be continued. In a few cases prescriptions were perpetuated when they should have been terminated as the indication was a temporary, remediable problem, such as thrombophlebitis. This highlights the need for review and stating clearly in the notes, on commencement, the indication for diuretic medication. Problem oriented notes or a computer summary would be of help here.

The choice of a diuretic drug is considerable, reflecting the number of competing pharmaceutical companies. Twenty three different diuretic drugs were identified in this study. Choice is dictated by the clinical condition but for the same condition there was wide variation in the cost of drug chosen. A few diuretic drugs were responsible for a disproportionate amount of the annual expenditure of £13 643.

There are a variety of reasons for the prescription of more expensive drugs. Eight out of the 10 prescriptions of indapamide were started in one year, 1980; this may have been the year the drug came on the market and was advertised. There have been no further prescriptions of this drug since 1982. The fact that 10 patients remain on the drug may be due to the reluctance of both patient and doctor to change a drug taken in the long term once started. Other oddities such as xipamide, *Aprinox* and *Lasilactone* may still be prescribed for the same reason. *Frumil* is one of a small range of diuretic drugs initiated by hospital doctors. However, most prescriptions for *Frumil* were initiated by general practitioners. This may be because general practitioners follow the prescribing habits of hospital doctors from discharge summaries or because they acquired habits while working as junior hospital doctors and continue these when in general practice. Combination tablets may be prescribed for convenience, especially for elderly patients who have failing memories and difficulties in taking tablets.

Are combination tablets really necessary? With respect to tablets containing supplementary potassium, most patients taking a diuretic drug for hypertension or heart failure in the long term do not develop clinically significant hypokalaemia, that is a serum potassium concentration below 3.0 mmol l<sup>-1</sup>.<sup>7</sup> Nonetheless, some patients do and this can have serious consequences for those with ischaemic heart disease or taking arrhythmia-inducing drugs such as digoxin. This subgroup can usually be detected within two months if their urea and electrolyte levels are checked at that time.<sup>8</sup> Studies have shown that there is no difference in the serum potassium levels of patients taking diuretic drugs with or without a potassium supplement.<sup>9</sup> This is because the tablets contain only 7.0–8.0 mmol of potassium, which is insufficient to prevent or correct hypokalaemia in patients at risk. To have a useful effect on serum potassium levels patients should have at least 24 mmol of potassium a day.<sup>10</sup> Patients at risk from hypokalaemia, or those with hypokalaemia, are better treated with a course of potassium tablets or a potassium-sparing diuretic drug. However, it is important that potassium-sparing diuretic drugs are avoided if possible as they can cause hyponatraemia and hyperkalaemia.

Within the confines of efficacy and convenience, considerable savings could be made by prescribing only bendrofluzide, frusemide, amiloride and potassium supplements. A prerequisite for the use of diuretic drugs is that their effects are monitored, particularly in elderly people.<sup>11</sup> Disturbances of electrolyte levels usually appear within two months and therefore measurements should be made when the drug is first prescribed and one and two months later. Elderly patients or those at risk from electrolyte disturbances should continue to have regular checks. The following recommendations can be made:

- The indication for initiating diuretic drugs should be clearly stated in the notes.
- Expensive drugs should not be prescribed when there are suitable cheaper alternatives.
- Patients who develop or are at risk from the effects of hypokalaemia should be identified.
- Only these patients should receive a potassium-sparing diuretic drug or a potassium supplement.
- Patients taking diuretic drugs should be regularly monitored; this should include measurement of urea and electrolyte levels.

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