Implementation of ward-based clinical pharmacy services in Belgium –

Description of the impact on a geriatric unit.

Anne Spinewine, Soraya Dhillon, Louise Mallet, Paul M Tulkens, Léon Wilmotte, Christian Swine

**Anne Spinewine** MPharm MSc, Research Fellow, Center for Clinical Pharmacy, School of Pharmacy, Université catholique de Louvain, Brussels, Belgium No middle initial

**Soraya Dhillon** PhD, MRPharmS Foundation Professor and Head of The School of Pharmacy, School of Pharmacy, University of Hertfordshire, AL10 9AB Herts, United Kingdom No middle initial

**Louise Mallet** PharmD, Associate clinical professor and clinical pharmacist in geriatrics, Faculty of Pharmacy, Université de Montréal, and McGill University Health Center, Montréal, Québec, Canada No middle initial

**Paul M Tulkens** MD PhD, Professor of pharmacology and pharmacotherapy, Center for Clinical Pharmacy, School of Pharmacy, Université catholique de Louvain, Brussels, Belgium

**Léon Wilmotte** MPharm, Chief Pharmacist, Center for Clinical Pharmacy and Cliniques Universitaires Saint-Luc, Université catholique de Louvain, Brussels, Belgium No middle initial

**Christian Swine** MD, Professor in Geriatrics and Gerontology, Center for Clinical Pharmacy and Department of Geriatric Medicine, Mont-Godinne University Hospital, Yvoir, Belgium No middle initial
Correspondence to:
Anne Spinewine
School of Pharmacy - Université catholique de Louvain
Center for Clinical Pharmacy
UCL 73.70 Avenue E. Mounier, 73
1200 Bruxelles – Belgium
Telephone: ++32/2/764.73.78
Fax: ++32/2/764.73.73
E-mail: anne.spinewine@facm.ucl.ac.be

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Abstract

Background
Patient-centered clinical pharmacy services are still poorly developed in Europe despite their demonstrated advantages in North America and the United Kingdom. Reporting European pilot experiences is therefore important to assess the usefulness of clinical pharmacy services in this specific context.

Objectives
To report the results of the first implementation of Belgian clinical pharmacy services targeting patients at high risk of drug-related problems.

Methods
Intervention study by a trained clinical pharmacist providing pharmaceutical care to 101 patients (mean age 82.2 years; mean number of prescribed drugs 7.8 ± 3.5) admitted on an acute geriatric unit for a seven-month period. All interventions to optimize prescribing, and their acceptance, were recorded. An external panel (two geriatricians and one clinical pharmacist) assessed their clinical significance. Persistence of interventions post-discharge was assessed through telephone calls.

Results
A total of 1066 interventions were made over the 7 month period. The most frequent drug-related problems underlying interventions were: underuse [15.9%], wrong dose [11.9%], inappropriate duration of therapy [9.7%], and inappropriate choice of medicine [9.6%]). The consequences were most frequently to: discontinue a drug [24.5%]; add a drug [18.6%]; and change dosage [13.7%]. Acceptance rate by medical doctors was 87.8%. Among interventions with clinical impact, 68.3% and 28.6% had moderate and major clinical significance, respectively. Persistence of chronic treatment changes three months after discharge was 84%.
Conclusion

Involving a trained clinical pharmacist in a geriatric team led to clinically-relevant and well-accepted optimization of medicines use. This initiative may be a springboard for further development of clinical pharmacy services.
Introduction

Improving patient safety is an important priority for any health care system. This involves reducing adverse drug events (ADEs) and optimizing the safe and effective use of medicines. Clinical pharmacy services (CPSs) are patient-oriented services developed to promote the rational use of medicines, and more specifically to maximize therapeutic effect, minimize risk, minimize cost and respect patient choice. To achieve this, clinical pharmacists can perform medication histories, medication reviews, attend ward rounds, provide recommendations on drug selection and follow-up, provide counseling to patients and providers. The positive impact of CPSs (or pharmaceutical care services) on clinical, economic and humanistic outcomes has been demonstrated in numerous publications in North America and in the United Kingdom (UK). Despite this, there is much inter-country and intra-country variability in the practice of clinical pharmacy (CP), and CP is still in infancy stages in most European countries. Leblanc and Dasta highlighted that, in order to ease the development of CPSs and demonstrate their value, hospital pharmacists should report their experiences in international journals.

In Belgium, hospital pharmacists spend limited time on clinical tasks. However, there has been for many years a desire to develop CPSs, and a legal framework has been in place since 1991 (through the definition of the clinical tasks of hospital pharmacists in a Royal Decree). Barriers to the implementation of CPSs have been the lack of specific training for pharmacists, the limited pharmacy manpower, the absence of financial support, and the fear of poor acceptance from health care professionals (HCPs). Several factors, however, have been identified as driving forces for the implementation of CPSs. These included the national and local willingness to improve the quality of drug use and to reduce costs, and a government-
planned limitation in the number of practicing doctors. It is in this context that CP education and practice have been developed by a joint effort of our University and University-based teaching hospitals, and a first pilot intervention study has been undertaken in one of the affiliated teaching hospitals.

An important aspect of strategic planning for implementing CPSs is to target patients at high risk of ADEs, because these are more likely to benefit. Elderly patients are among these, because of multiple comorbidities, multiple medication use, altered pharmacokinetics and pharmacodynamics, and frequent inappropriate prescribing. Suboptimal prescribing and ADEs/adverse drug reactions (ADRs) can occur on admission to hospital, during hospital stay, and after discharge. Only a few North American studies have evaluated the impact of multidisciplinary teams that included clinical pharmacists on drug-related outcomes for elderly inpatients. Their applicability to European settings where CP is developing is not established.

The aim of the present paper is therefore to report the results of the first intervention study performed by a clinical pharmacist providing pharmaceutical care on the geriatric unit of a university hospital. The objectives are to (i) describe the characteristics of interventions made by the clinical pharmacist, (ii) measure their acceptance by prescribers and their clinical significance, and (iii) measure their persistence after discharge. This is part of a larger program aiming at determining the feasibility of providing CPSs, identifying the driving forces and barriers for implementation.
Methods

The first section below refers to the global process that we followed for the development of CP at the practice and education levels. The other sections focus on the intervention study in geriatrics and detail its methodology.

Development of CP

CP practice and education in CP were created at our University in 2003 through a joint initiative of the Faculty of Medicine and the affiliated teaching hospitals. The present implementation relies on (i) a new teaching program for hospital pharmacists consisting of a Certificate degree (90 hours) and a Masters degree (one year) in Clinical Pharmacy; (ii) a doctoral (PhD) program for research in CP (see description on http://www.md.ucl.ac.be/pharma/cfcl/intro.htm) This provided the conceptual and scientific support to enable studies such as the one described here. Appendix 1 summarizes the important aspects of the implementation process that, we believe, may be of interest to pharmacists willing to develop CPSs in other countries.

Setting

The study took place between November 2003 and May 2004 on the geriatric unit (27 beds) of a 350-bed teaching hospital in Belgium. The unit admits frail patients aged 70 years and older presenting with typical acute geriatric problems. Patients are cared for by a multidisciplinary team composed of two geriatricians, two physicians (i.e. doctors specializing in hospital care), nurses, two physiotherapists, a social worker, a psychologist and an occupational therapist. Medical care, rehabilitation and discharge planning are provided.

All patients admitted on the unit during the study period were eligible for inclusion in the study. Exclusion criteria were: patients with a terminal illness; refusal
to participate; length of stay ≤ 48 hours; inability for the pharmacist to perform an abstracted chart within 3 days of admission for time reasons; inclusion during previous admission. The Ethics Committee of the Institution approved the study protocol. Informed written consent was obtained from each participant (from relative or caregiver if patient unable to give consent, for example if confusional state or cognitive impairment).

**Intervention**

The intervention consisted of a clinical pharmacist providing pharmaceutical care from admission to discharge (Figure 1). The pharmacist had a postgraduate degree in CP and previous experience in geriatrics. The pharmacist was present on the ward four days a week, participated in medical and multidisciplinary rounds, had direct contact with patients/caregivers, and had access to the complete medical record, including biological data and results of diagnostic tests. For each patient the clinical pharmacist performed a medication history on admission, and prepared an abstracted patient record with demographic, clinical and pharmaceutical data. The appropriateness of treatment was then analyzed and a pharmaceutical care plan was prepared.\textsuperscript{13,14} Whenever an opportunity for optimization was identified, on admission or later during hospital stay, the clinical pharmacist intervened. Interventions could occur during rounds or through discussions outside of the formal rounds time. They could pertain to acute or chronic medicines, and to medicines prescribed on a regular basis or as-needed. Each intervention was made orally. The pharmacist provided written information if judged necessary by herself or if asked by the prescriber. The pharmacist also answered questions on medications asked by other HCPs. At discharge, the clinical pharmacist provided information on treatment changes to
patient/caregiver and general practitioner (GP). A written plan (including name of
drugs, indication, dosage and form, frequency and time of administration, modalities
of administration, list of drugs discontinued and reason) was given to the former,
together with oral explanations. For the latter, at the end of each discharge letter
prepared by the physician, the pharmacist added a section entitled “reasons for
changes in medications, and recommendations for follow-up”. Its content was
approved by the medical doctor in charge.

Data collection
The clinical pharmacist recorded each intervention performed, using an intervention
form developed during the pilot phase (the latter was performed over a two-week
period, on a convenience sample of 20 inpatients – its objective was to test the
feasibility and the reliability of data collection). The definition of an intervention was:
a recommendation made by the clinical pharmacist to a HCP, that pertained to drug
therapy and that aimed to improve the quality of drug use. Interventions could be
initiated by the pharmacist or by another HCP asking a question to the clinical
pharmacist. Patient counseling and medication histories were not recorded as
interventions.
The following information was recorded on the form: type of HCP eliciting the
intervention (clinical pharmacist on her own, or other HCP upon request); HCP to
whom the pharmacist made the recommendation; underlying drug-related problem
(DRP - 17 categories); type of intervention (13 categories); drug involved
(Anatomical Therapeutic Chemical [ATC] code)\textsuperscript{15}; description of intervention (and
outcome – as measured for short-term effects, and as anticipated for long-term
effects); and acceptance. We defined a DRP as an event or circumstance involving
drug therapy that actually or potentially interferes with desired health outcomes. The classification systems for DRPs and types of interventions were based on previous classifications and on pilot work.

Clinical significance

All interventions that had potential clinical impact (namely an impact on the efficacy or safety of treatment, therefore excluding interventions with impact exclusively on cost or compliance), and that were subsequently accepted by HCPs were validated by an expert panel. The panel was composed of two Belgian geriatricians and one visiting Canadian clinical pharmacist with expertise in geriatrics and knowledge of the local setting. None were involved in the care of patients included in the study. Experts used a scale developed according to previous scales (“minor” - no benefit or minor benefit depending on professional interpretation; “moderate” – recommendation that brings care to a more acceptable and appropriate level of practice, or that may prevent an ADE of moderate importance; “major” – intervention that may prevent serious morbidity, including readmission, serious organ dysfunction or a serious ADE; “extreme” – life saving; “deleterious” – intervention that may lead to adverse outcome). Written instructions and examples from pilot work were provided. Panelists first rated each intervention individually, and then met to compare their ratings. Whenever individual ratings differed, the panel discussed to reach a consensus for each intervention.

Persistence of interventions after discharge

For interventions relating to chronic treatments, we recorded whether the treatment change initiated by the pharmacist and operated in the hospital was still in application
three months after discharge. This was done because quantitative evidence indicates that treatment changes are frequent after discharge.\textsuperscript{20} All patients were followed up one month and three months post-discharge, through telephone calls performed by two trained hospital pharmacists who were not involved in the rest of the study. The questionnaire was developed by one pharmacist and by the main researcher. It was pilot tested with five patients, to check for appropriate questioning and understanding. Data were provided by the person preparing medications (patient or caregiver), and included medicines taken post-discharge.

\textbf{Data analysis}

Analysis was performed using SPSS (Statistical Package for Social Sciences, version 11.0). Descriptive statistics were used for characterizing interventions. Inter-rater reliability for classifying DRPs and types of interventions was checked. Two clinical pharmacists coded 33 interventions made during the pilot study. Cohen’s kappa\textsuperscript{21} was 0.87 for the underlying DRP and 0.96 for the type of intervention, indicating good agreement.
Results

Characteristics of patients

The clinical pharmacist provided pharmaceutical care to 101 patients. Seventy-three percent were female, 72% were living in the community and 36% had received previous geriatric care. Their mean age (SD) was 82.2 years (6.9). The average number of drugs prescribed on a regular schedule per patient was 7.8 (3.5) and the average number of daily doses was 9.8 (4.7). Mean length of stay was 19.7 days (12.1).

Characteristics of interventions

The pharmacist made 1066 drug-related interventions. The person initiating the intervention was the clinical pharmacist herself (i.e. she identified a DRP and made a recommendation to resolve the problem) in 84.9% of cases (n=905), and another HCP (i.e. another HCP asked a question to the clinical pharmacist who made a recommendation in answer to that question) in 15.1% of cases (n=161). This represents a mean of 8.9 interventions initiated by the pharmacist per patient (median 8), and of 1.6 interventions initiated by another HCP per patient (median 1). Table 1 summarizes the main characteristics of all interventions (n=1066), their acceptance and clinical significance. 87.8% and 7.2% of all interventions were fully and partially accepted by medical doctors, respectively. The most common classes of drugs (ATC level 2\(^1\)) were antithrombotic agents (B01, 9.1% of all interventions), psycholeptics (N05, 8.8% - include antipsychotics, anxiolytics, hypnotics and sedatives), psychoanaleptics (N06, 8.2% - include antidepressants and anti-dementia drugs).

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\(^1\) The ATC system is a tool for drug utilization research, developed and promoted by the WHO collaborating Center for drug statistics methodology. In this system, drugs are divided into different groups according to the organ or system on which they act and their chemical, pharmacological and therapeutic properties. Full information on this classification can be obtained at: http://www.whocc.no/atcddd/
analgesics (N02, 6.9%), and drugs for obstructive airway diseases (R03, 6.6%). There were no major differences in the characteristics of interventions initiated by the pharmacist versus interventions initiated by another HCP.

Clinical significance

The external panel assessed the clinical significance of 700 interventions (table 1b – the remaining 366 interventions were excluded because they had no direct clinical impact). Individual ratings differed for two-thirds of evaluations, and discrepancies originated equally from the three panelists. After discussion and consensus, there was a mean (SD; median) of 4.7 (3.8;4) and 1.9 (2.1;1) moderate and major interventions per patient respectively. Examples are provided in table 2. The results were similar for interventions initiated by the pharmacist or by another HCP.

Persistence of interventions after discharge

Three months after discharge, patients could be reached to obtain follow-up data on the persistence of interventions relating to the treatment of chronic conditions in 88% of cases (missing data were related to various types of DRPs and treatment changes). For moderate and major chronic interventions, 83.8% and 85.4% of treatment changes persisted three months post-discharge respectively. The majority of treatment changes that had not been followed up were not systematically associated to specific drugs of DRPs.
Discussion

The present study reports the development of patient-centered CPSs. A structured process was followed that included a reflection on international experiences as well as paying special attention to local and national considerations, and taking advantage of local driving forces. Several barriers initially thought to limit the development of CPSs, such as poor acceptance from HCPs, lack of training, and insufficient hospital-faculty collaboration, were overcome. In addition, careful documentation of impact was done, through the combination of practice and research activities.

To our knowledge, this is the first study to report involvement of a clinical pharmacist in acute patient care in Belgium, and it is one of the first international reports on the involvement of clinical pharmacists in the care of acutely ill frail elderly patients. We found that the clinical pharmacist, through the provision of pharmaceutical care, was able to propose a large number of interventions relating to a wide variety of DRPs and drugs. The majority of these interventions were accepted and were deemed clinically relevant.

Several reasons may have accounted for the high acceptance rate of interventions (table 3), and these could be taken into consideration for developing additional CPSs in Belgium and abroad. The clinical pharmacist used a structured approach to provide pharmaceutical care.\textsuperscript{13,14} Furthermore, the communication between the clinical pharmacist and the physician (and other HCPs) may have been critical. Previous studies reported acceptance rates varying from less than 50% to over 90%.\textsuperscript{22,23} A low value of 47.5% was observed in a European study, where the authors stated that there was a lack of communication and an insufficient multidisciplinary
Higher values (67% to 81%) were reported in a North American study in which the pharmacist met with the physician to discuss DRPs. In our study, the pharmacist was part of the multidisciplinary team, and there was a direct contact between the pharmacist and the prescribers. The fact that most interventions persisted after discharge is also encouraging. To our knowledge, that kind of measure has never been reported.

A comparison of the characteristics of our interventions with data from the literature gives external validity to the results. Firstly, the most frequent DRPs underlying the interventions (table 1a) fit prevalent types of inappropriate prescribing in the elderly. This underlines the relevance of our interventions. For example, observational studies have identified high levels of underuse for the treatment of osteoporosis, for the prevention of thromboembolic diseases, and for pain control. Under-dosing of angiotensin-converting enzyme inhibitors is frequent, as is inappropriate use of psychotropic drugs. In a study describing DRPs in 827 patients hospitalized in Norway (mean age 71.7 years), the number of DRPs per patient was lower than in our study, but the drugs most often involved for each type of DRP were similar to our results. Secondly, the drugs most commonly involved in interventions in this study (anti-thrombotic agents, psycholeptics, psychoanaleptics and analgesics) frequently lead to ADEs/ADRs in the elderly. The clinical pharmacist has therefore probably helped to improve patient safety though the prevention or resolution of frequent ADEs.

The external validation of the clinical importance of interventions by Belgian and foreign experts further strengthens the results. Direct comparison with other
studies is however difficult for several reasons. Firstly, the definitions of minor versus moderate versus major interventions vary from one study to another. Secondly, the clinical importance of a single intervention made for an adult or for a frail older patient may be different, because the risk and seriousness of ADEs is higher in the latter group. Hence the age and frailty of the population should be taken into consideration when assessing clinical importance. This was done by having experts in geriatrics on the panel.

The present study has several limitations. First, it represents interventions made by a single clinical pharmacist working on one geriatric unit, raising the issue of generalizability. Such a limited pilot study was however essential in our context, and we believe that it will pave the way for generalization of CPSs delivered by other pharmacists, on other units and with other physicians. In fact the pharmaceutical care model described here is now being replicated on other units in our institution, and a full-time position for a clinical pharmacist has recently been created. Second, we did not address the pharmacoeconomic aspects of the intervention, even though we are aware that these will be essential to justify further development of CP. Third, from a research perspective, measuring pharmacist’s interventions is only an indirect measure of the impact on the quality of medicines use. Further work should address the impact of the intervention on direct measures of prescribing appropriateness and/or on actual ADEs.
Conclusion

Patient-centered CPSs aim to promote a rational use of medicines. This practice is well developed in North America and the United Kingdom. Our study shows that is possible to implement new ward-based CPSs in Europe, using a structured approach. In addition, the present study provides new data on the impact of pharmaceutical care in a population for which limited international data is available, namely frail elderly inpatients. Most interventions made by the clinical pharmacist were accepted by HCPs, were deemed clinically relevant by external experts, and the improvements made were largely maintained after discharge. Attention paid to key factors required for success in developing CPSs may have significantly contributed to the results.
Acknowledgments

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Table 1a: Characteristics of interventions made by the clinical pharmacist (n=1066): DRPs and drug

<table>
<thead>
<tr>
<th>DRPs underlying interventions</th>
<th>Number of interventions (%)</th>
<th>Drugs most often involved</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underuse</td>
<td>169 (15.9)</td>
<td>Calcium/vitamin D, antithrombotics, analgesics</td>
</tr>
<tr>
<td>Wrong dose</td>
<td>127 (11.9)</td>
<td>Antibiotics, psycholeptics&lt;sup&gt;d&lt;/sup&gt;, psychoanaleptics&lt;sup&gt;d&lt;/sup&gt;, ACEI and ARA</td>
</tr>
<tr>
<td>Inappropriate duration of therapy</td>
<td>103 (9.7)</td>
<td>Psycholeptics&lt;sup&gt;d&lt;/sup&gt;, heparins, anti-asthmatics, antibiotics</td>
</tr>
<tr>
<td>Inappropriate choice of medicine</td>
<td>102 (9.6)</td>
<td>Psycholeptics&lt;sup&gt;d&lt;/sup&gt;, psychoanaleptics&lt;sup&gt;d&lt;/sup&gt;, analgesics</td>
</tr>
<tr>
<td>No valid indication</td>
<td>74 (6.9)</td>
<td>Antithrombotics, antacids and anti-ulcer drugs</td>
</tr>
<tr>
<td>No specific problem&lt;sup&gt;a&lt;/sup&gt;</td>
<td>72 (6.8)</td>
<td>Psychoanaleptics&lt;sup&gt;d&lt;/sup&gt;, psycholeptics&lt;sup&gt;d&lt;/sup&gt;, ACEI and ARA, hypolipemics</td>
</tr>
<tr>
<td>Inappropriate modalities of administration&lt;sup&gt;b&lt;/sup&gt;</td>
<td>65 (6.1)</td>
<td>Analgesics, antibiotics, psychoanaleptics&lt;sup&gt;d&lt;/sup&gt;, anti-asthmatics</td>
</tr>
<tr>
<td>ADR&lt;sup&gt;c&lt;/sup&gt; suspected or confirmed</td>
<td>57 (5.3)</td>
<td>Psychoanaleptics&lt;sup&gt;d&lt;/sup&gt;, diuretics, analgesics</td>
</tr>
<tr>
<td>Error in medication history</td>
<td>55 (5.2)</td>
<td>Psychoanaleptics&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Inappropriate follow-up</td>
<td>41 (3.8)</td>
<td>Anti-anemics, cardiac therapy (digoxin)</td>
</tr>
<tr>
<td>Prescription-writing error</td>
<td>36 (3.4)</td>
<td>Psycholeptics&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>Drug-disease interaction (including allergy)</td>
<td>35 (3.3)</td>
<td>Beta-blockers, ACEI and ARA, bisphosphonates, psychoanaleptics&lt;sup&gt;d&lt;/sup&gt;</td>
</tr>
<tr>
<td>DRPs underlying interventions</td>
<td>Number of interventions (%)</td>
<td>Drugs most often involved</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>----------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>Duplication</td>
<td>34 (3.2)</td>
<td>Psycholeptics&lt;sup&gt;a&lt;/sup&gt;, antiasthmatics</td>
</tr>
<tr>
<td>Less costly alternative</td>
<td>32 (3.0)</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>Modalities of administration not practical for the patient</td>
<td>26 (2.4)</td>
<td>Miscellaneous</td>
</tr>
<tr>
<td>Drug-drug interaction</td>
<td>24 (2.3)</td>
<td>Antithrombotics</td>
</tr>
<tr>
<td>Other</td>
<td>14 (1.3)</td>
<td>Miscellaneous</td>
</tr>
</tbody>
</table>

Abbreviations: ACEI: angiotensin-converting enzyme inhibitor; ADR: adverse drug reaction; ARA: angiotensin-receptor antagonist; DRP: drug-related problem.

<sup>a</sup> No underlying DRP, for example when doctors asked a question without the presence of a DRP for a specific patient.

<sup>b</sup> Modalities of administration include frequency of administration, time, route, and formulation.

<sup>c</sup> An ADR was defined as noxious and unintended reaction to a drug, that occurred at doses normally used in humans, and that could not be related to another DRP.
See http://www.whoce.no/actddd/ for comprehensive information on these subclasses; psycholeptics include antipsychotics, anxiolytics, hypnotics and sedatives; psychoanaleptics include antidepressants and anti-dementia drugs.
### Table 1b: Characteristics of interventions made by the clinical pharmacist (n=1066): type, acceptance and clinical importance

<table>
<thead>
<tr>
<th>Type of intervention</th>
<th>Number (%)</th>
<th>Acceptance rate (%)</th>
<th>Clinical importance (%)&lt;sup&gt;b&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Full</td>
<td>Partial&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td>Discontinue medicine</td>
<td>261 (24.5)</td>
<td>87.4</td>
<td>6.5</td>
</tr>
<tr>
<td>Add a new drug</td>
<td>198 (18.6)</td>
<td>88.9</td>
<td>6.1</td>
</tr>
<tr>
<td>Change dose</td>
<td>146 (13.7)</td>
<td>92.5</td>
<td>3.4</td>
</tr>
<tr>
<td>Educate/inform HCP</td>
<td>107 (10.0)</td>
<td>96.8</td>
<td>3.2</td>
</tr>
<tr>
<td>Switch to other drug</td>
<td>95 (8.9)</td>
<td>76.8</td>
<td>10.5</td>
</tr>
<tr>
<td>Other</td>
<td>259 (24.3)</td>
<td>85.7</td>
<td>10.8</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1066 (100)</strong></td>
<td><strong>87.8</strong></td>
<td><strong>7.2</strong></td>
</tr>
</tbody>
</table>

Abbreviation: HCP: health care professional; NA: not applicable (i.e. clinical importance not assessed by the external panel because the intervention was not initiated by the clinical pharmacist, and/or because it did not lead to direct change in the treatment of a specific patient)

<sup>a</sup> Advice accepted but not acted upon, or partially acted upon.

<sup>b</sup> N = 700 interventions (the external panel assessed the clinical significance of 700 interventions – the remaining 366 interventions were excluded because they had no direct clinical impact)
Table 2: Examples of interventions initiated by the clinical pharmacist

Interventions of moderate clinical importance

Example 1
- Drug-related problem: zopiclone started the day after admission for insomnia; two weeks later, patient about to be discharged, sleeps well; but patient at risk of falling.
- Intervention: stop zopiclone and explain the rationale to the patient (treatment must be short-term, no need for it at home, and risk of side-effects including falls).

Example 2
- Drug-related problem: two anti-histamines (hydroxyzine and cetirizine) prescribed by the general practitioner for pruritus; both prescriptions rewritten in the hospital.
- Intervention: duplication of treatment; little benefit but increased risks of side-effects → discontinue hydroxyzine (more anticholinergic and sedative effects than cetirizine) and monitor for symptoms of pruritus.

Interventions of major clinical importance

Example 1
- Drug-related problem: nausea reported, and digoxin dose increased three days before.
- Intervention: check ECG and blood level; discontinue or decrease dose if intoxication confirmed (note: intoxication was confirmed).

Example 2
- Drug-related problem: patient with diabetes and peripheral arterial disease; no cardiovascular prophylaxis, and no contra-indication.
- Intervention: start aspirin 100mg/day.
Table 3: Factors likely to have contributed to successful implementation

<table>
<thead>
<tr>
<th>Before the study</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Hospital and ward managers open to collaboration</td>
</tr>
<tr>
<td>b) Close collaboration with the hospital pharmacy department</td>
</tr>
<tr>
<td>c) Willingness to target patients at high risk of adverse drug events</td>
</tr>
<tr>
<td>d) Needs identification through qualitative analysis</td>
</tr>
<tr>
<td>e) Objectives of the study well defined and communicated to health-care professionals</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>During the study</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Presence of pharmacist on a regular basis (0.8 full-time equivalent)</td>
</tr>
<tr>
<td>b) Structured process for pharmacist to evaluate patient (pharmaceutical care)</td>
</tr>
<tr>
<td>c) Pharmacist with adequate training in clinical pharmacy / pharmacotherapy in the elderly</td>
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<td>d) Direct contact with members of the multidisciplinary team, with patients and caregivers</td>
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<td>e) Close collaboration with the hospital pharmacy department</td>
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References


Appendix: Important aspects in the process of implementing clinical pharmacy services in Belgium

When the project started in 2002, Belgian physicians and pharmacists were not unfamiliar with the concept of clinical pharmacy and with its usefulness in terms of improved use of medicines, mainly because of previous contacts with colleagues in North America and in the UK. However, its effective implementation had not been initiated yet due to doubts on its feasibility in the national context.

To address this issue and to maximize the chances of success in launching a pilot program, a coordinated action was set up at the level of our Institution. Its objectives were (i) to identify the favoring and limiting factors relevant to the local situation (see the introduction of the article and reference [5] for more information); (ii) to clearly explain the project and its advantages to all interested parties, but without concealing the expected difficulties; (iii) to set up an agenda for the implementation of the necessary changes in (a) the teaching programs (for undergraduate, postgraduate and PhD students) and (b) the hospital pharmacy (see Table). In this process, a series of critical questions were raised. The answers given were based on a balance between what clinical pharmacy/pharmaceutical care should be and the local constraints or experience.
Table: Different steps in the implementation of ward-based clinical pharmacy services

A. Preparing the hospital pharmacy
   - Make sure that hospital pharmacists agree on the willingness to change practice; define the objectives and the means;
   - Optimize the distribution and administrative tasks;
   - Identify the training needs of hospital pharmacists and the needs relative to medicines information resources and skills.

B. Preparing the key persons at the hospital level
   - Sensitize the hospital board managers and the Medical Therapeutic Committee to the willingness to change; agree on the objectives and methods of the pilot project.

C. Developing a comprehensive but realistic academic teaching program
   - Identify the training needs of hospital pharmacists, and implement relevant changes at each educational levels (undergraduate, postgraduate and research programs).

D. Launching pilot ward-based clinical pharmacy projects
   - Define one or two wards where one or two clinical pharmacists can start;
   - Establish a first contact with the key persons of the ward (main doctor and main nurse) and agree on the objectives and method of the project;
   - Reflect on the pilot experience at regular intervals with the key persons involved, and perform a detailed evaluation at the end of the pilot phase.
Important questions raised during the implementation process

1. What is the value of considering the North American/UK experience? Should we attempt to replicate it?

In our case, the experience of North America/UK was highly valuable but we did not simply replicate it. International experts participated and/or gave advice for the implementation process. In parallel, several Belgian pharmacists were trained abroad. This enabled us (i) to clearly define the potential models of clinical pharmacy/pharmaceutical care practice and education, and (ii) to objectively inform the decision-making persons about the respective successes and failures of the North American/UK models. None of them, however, entirely match the local needs. The driving forces were not the same, and the baseline education programs and skills of graduated Belgian pharmacists were also quite different from the US or UK. The model that we developed took therefore account of these baseline differences.

2. Should clinical pharmacists be distinct from hospital pharmacists?

This “distinct model”, which is most frequently encountered in the US, was considered unacceptable by Belgian hospital pharmacists, who wanted to be themselves the future clinical pharmacists (as in the UK and Canadian models). In our present model, clinical pharmacists are therefore hospital pharmacists who acquire an additional Certificate or Masters level in clinical pharmacy. They are able to perform clinical and non clinical tasks.

3. What were the respective roles of Faculty members and of hospital pharmacists?

Responsibilities were shared. Faculty members were mainly responsible for creating the necessary educational programs, and for defining the pilot projects linked to PhD
research programs. Hospital pharmacists oversaw the implementation of the pilot projects within the hospital setting, managed the contacts and exchanges with health care providers at all levels, and ensured that the activities of the clinical pharmacists in the hospital were made with full respect of the ethical and medical requirements with which they are familiar. A close Faculty-hospital collaboration has been essential to the present success of our implementation.

4. Should the activities of the clinical pharmacists be linked to research activities?
This was considered as a major requirement for a successful implementation in a University teaching hospital. Our present model encompasses clinical pharmacists seeking a PhD degree (4-5 years program with presentation of a full dissertation and publications in peer-reviewed international journals) and clinical pharmacists with more limited research activities but who must, nevertheless, contribute to the development of research in clinical pharmacy.

5. Should pharmacoeconomy be an important part in the development of clinical pharmacy?
In contrast to the situating prevailing in the United States, most clinical and pharmaceutical activities are still performed under a “fee for service” scheme in Belgium. Drug savings were therefore not perceived as critical, and could even be counterproductive, as far as hospital pharmacies (and pharmaceutical industries) are concerned. This situation is, however, under reevaluation, as financing based on diagnosis-related group is being implemented. Clinical pharmacists may therefore play an additional important role in the near future to support this.