Evaluation of the implementation of a clinical pharmacy service on an acute internal medicine ward in Italy

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Abstract

Background: Successful implementation of clinical pharmacy services is associated with improvement of appropriateness of prescribing. Both high clinical significance of pharmacist interventions and their high acceptance rate mean that potential harm to patients could be avoided. Evidence shows that low acceptance rate of pharmacist interventions can be associated with lack of communication between pharmacists and the rest of the healthcare team. The objective of this study was to evaluate the effect of a structured communication strategy on acceptance rate of interventions made by a clinical pharmacist implementing a ward-based clinical pharmacy service targeting elderly patients at high risk of drug-related problems. Characteristics of interventions made to improve appropriateness of prescribing, their clinical significance and intervention acceptance rate by doctors were recorded.

Methods: A clinical pharmacy intervention study was conducted between September 2013 and December 2013 in an internal medicine ward of a teaching hospital. A trained clinical pharmacist provided pharmaceutical care to 94 patients aged over 70 years. The clinical pharmacist used the following communication and marketing tools to implement the service described: Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis; Specific, Measurable, Achievable, Realistic and Timely (SMART) goals; Awareness, Interest, Desire, Action (AIDA) model.

Results: A total of 740 interventions were made by the clinical pharmacist. The most common drug classes involved in interventions were: antibacterials for systemic use (11.1%) and anti-parkinson drugs (10.8%). The main drug-related problem categories triggering interventions were: no specific problem (15.9%) and prescription writing error (12.0%). A total of 93.2% of interventions were fully accepted by physicians. After assessment by an external panel 63.2% of interventions (96 interventions/ per month) were considered of moderate clinical significance and 23.4% (36 interventions/ per month) of major clinical significance. The most frequent interventions were to educate a healthcare professional (20.4%) and change dose (16.1%).

Conclusions: To our knowledge this is the first study evaluating the effect of a structured communication strategy on acceptance rate of pharmacist interventions. Pharmaceutical care delivered by the clinical pharmacist is likely to have had beneficial outcomes. Clinical pharmacy services like the one described should be implemented widely to increase patient safety.

Keywords: Clinical pharmacist, Elderly, Drug-related problems, Pharmaceutical care, Communication
Background
Clinical pharmacy is a health science discipline in which pharmacists provide patient care that optimizes medication therapy and promotes health, wellness, and disease prevention [1]. Clinical pharmacy services developed at the end of 1960 in the United Kingdom and United States of America [2, 3] and they are now playing an important role in hospitals aiming to reduce medication errors and Adverse Drug Reactions (ADRs).

Appropriateness of prescribing is defined as the outcome of a process of decision-making that maximises net individual health gains within society’s available resources [4]. Inappropriate medication prescribing in the elderly is rising because of increase of ageing population, number of chronic conditions and number of drugs prescribed. A cohort study has found that 25.8% of elderly receive at least one potentially inappropriate medication [5]. Previous evidence has shown that drug histories taken at admission by a clinical pharmacist and participation of a clinical pharmacist in medical rounds reduce medication errors respectively by 51% and 29% [6]. It has also been shown that clinical pharmacists participating in medical rounds and taking drug histories at admission reduce the number of ADRs [7]. Reduction in medication errors and ADRs following the introduction of clinical pharmacists in hospitals has been shown to have a positive impact on reducing length of hospital stay and mortality rate [8].

A meta-analysis looking at the association of medication use and falling found that the use of sedatives, hypnotics, antidepressants and benzodiazepines had a significant association with falls in elderly patients [9]. Input of the clinical pharmacist in providing information for drug changes that might reduce fall risk has been shown to reduce falls by up to 70% [10, 11].

Acceptance rate of interventions made by clinical pharmacists is key as only those interventions accepted by the healthcare team will have an impact on patient care and might produce cost savings. Ward pharmacy services with a high acceptance rate of interventions made by clinical pharmacists are deemed to be cost-effective by policymakers. However, evidence shows that acceptance rate of clinical pharmacist interventions can be as low as 53% [12]. Assuming pharmacists with appropriate training and knowledge of pharmacotherapy are employed at ward level a possible cause for the low acceptance rate of pharmacist interventions is lack of communication between the pharmacist and the medical team [12].

There is an assumption that if pharmacists provide evidence base advice on medications, doctors, in turn, will implement them. However, this is not always the case and there is a need to foster active collaboration between the two professions applying models of communication from areas outside healthcare [13].

Several studies report on the introduction of ward based clinical pharmacy services with a satisfactory (> 80%) acceptance rate of interventions made by clinical pharmacists [14–17]. However, description of the reason behind the high acceptance rate of interventions is not reported.

Given there is no evidence on strategies adopted to enhance acceptance rate of interventions made by ward based clinical pharmacists the aim of the study was to assess the effect of a tailored communication strategy on the acceptance rate of interventions made by a clinical pharmacist implementing a ward based clinical pharmacy service targeting patients at high risk of drug-related problems. Characteristics of interventions made are described, their clinical importance is assessed and acceptance rate by doctors is measured.

Methods
Setting and patients
The study took place between September 2013 and December 2013 in an acute internal medicine unit of a 1099 beds teaching hospital in Italy. The unit has 39 beds and patients admitted are mostly elderly presenting typically with acute geriatric problems and multiple diseases. The healthcare team looking after patients is made of 5 physicians specialized in internal medicine, nurses, healthcare assistants, 1 physiotherapist, 1 dietician, and 1 social worker.

Patients aged 70 or over admitted to the unit were included in the study. Patients were excluded from the study if they suffered terminal illness (life expectancy < 3 months); if expected length of stay was ≤ 48 h; if they had been enrolled in the study during a previous admission; and if they had been transferred from another acute unit where they had been cared for by internal medicine physician(s).

Communication strategy
All key stakeholders (eg. hospital management, pharmacists, doctors, and nurses) were informed on the Strengths, Weaknesses, Opportunities and Threats (SWOT) of the new clinical pharmacy service using a SWOT analysis (Table 1). A SWOT analysis is a technique used in strategic planning to enhance understanding and decision-making in organizations and it can be applied to healthcare organizations when introducing a new service [18].

To prove effectiveness of the new clinical pharmacy service implemented to stakeholders type of interventions made was described, their acceptance rate was measured and their clinical significance was assessed. These goals were Specific, Measurable, Achievable, Realistic and Timely (SMART) in order to guide and facilitate reception of the message by stakeholders [19].
A marketing strategy targeting key stakeholders according to their degree of influence and importance was developed. Stakeholders’ analysis is reported in Fig. 1.

Hospital managers, chief pharmacist and senior medical staff were targeted with high priority as they would allocate resources and ultimately decide whether to introduce and expand the clinical pharmacy service as part of standard care. Junior doctors, nurses, patients and pharmacists had high importance as they would provide feedback to senior staff and hospital management. However, their influence was low as they were not decision makers. Local PCT had high influence as they were decision makers and were involved in allocating resources.

A marketing plan was developed according to characteristics of the new service implemented and stakeholders (Fig. 2) with particular emphasis on Awareness, Interest, Desire, Action (AIDA model). The AIDA model is used in marketing to help communicate effectively with stakeholders in a way that better responds to their needs and desires [20].

### Table 1 SWOT analysis

| STRENGTHS                          | WEAKNESSES                                                                 |
|------------------------------------|---------------------------------------------------------------------------|
| 1. Chief pharmacist and Internal Medicine consultant supporting the project. | 1. Ward pharmacy service offered only Monday to Friday with no weekend cover. |
| 2. Decrease in medication errors, ADRs and falls enhances patient safety. | 2. Night on call ward pharmacy service not provided.                       |
| 3. Potential for reduction in length of hospital stay and related savings. | 3. Potential concerns of doctors and nurses with regard to clinical training of the pharmacist. |
| OPPORTUNITIES                      | THREATS                                                                  |
| 1. Opportunity for the trust to introduce ward clinical pharmacy.         | 1. Due to the current global financial crisis, it may be difficult to find resources to expand the service in the short term. |
| 2. The trust is a teaching hospital and has therefore the potential for setting up post graduate clinical pharmacy programmes to train staff. | |

**Intervention**

An intervention was defined as any recommendation made by the clinical pharmacist to a healthcare professional, pertaining to drug therapy, which aims to improve the quality of medication use [14]. Recommendations were either made after a prescription was written in order to amend it or before a prescription was written in order to advise on most appropriate prescribing (e.g. statin post stroke in a patient with deranged liver function tests, beta-blocker post myocardial infarction in a patient with severe asthma). The pharmacist covered the internal medicine unit from Monday to Friday spending on average 7 h/day on the unit and providing pharmaceutical care from admission to discharge [21]. The pharmacist had knowledge in geriatric pharmacotherapy and was a trained clinical pharmacist. The pharmacist did ward rounds with the medical team in the morning and follow ups in the afternoon. The main tasks performed were: medicine reconciliation on admission; monitoring and optimization of medicine prescribed during hospital stay; and medicine reconciliation on discharge [22, 23]. Priority was given to new patients and patients going home on the day. The
pharmacist contributed to choice of drug regimen, provided evaluated information on pharmaceutical, therapeutic and toxicological aspects of drug therapy, contributed to choice of dosage, form and route of medicine, and helped with dosage calculations [24]. A pharmaceutical care plan was made for each new patient [23, 25]. The pharmacist had access to patient's medical records and blood tests. Interpretation of drug assays continued to be performed by the clinical pharmacology department as per standard care. When there was an opportunity for optimizing therapy, the pharmacist discussed it with the prescriber who could accept/ partially accept or reject the intervention. The pharmacist answered questions about medications asked by the healthcare team on the ward. Interventions could be triggered either by the pharmacist or by a member of the healthcare team asking a question to the pharmacist. Interventions made were usually communicated orally and recorded afterward in an intervention form. In the event the doctor looking after the patient was not present on the ward interventions made were communicated in writing on a pharmacist intervention note. The note reporting the intervention advised by the pharmacist was attached to the drug chart for the doctor to be reviewed.

**Data collection**

Information recorded on the intervention form were: underlying drug-related problem (DRP) category; drug involved (Anatomical Therapeutic Chemical [ATC] code) [26]; description of intervention; outcome; type of intervention and acceptance. Description of the outcome recorded for each intervention reported the changes that had occurred as a direct consequence of the intervention on the day it was made. A DRP was defined as an event or circumstance involving drug therapy that actually or potentially interferes with desired health outcomes [27]. DRPs and types of interventions were classified using a classification system previously described in the literature [14]. In brief, DRPs were divided in 17 categories and drug allergy was considered a DRP. Types of interventions were divided in 6 categories. Prior to the start of the study a pilot was conducted on a sample of 30 patients over a 2-week period to assess viability and reliability of the intervention form.

**Clinical significance**

Clinical significance of interventions was defined using a scale, developed by Spinewine and colleagues, with 5 categories: 1) minor: no benefit or minor benefit, depending on professional interpretation; 2) moderate: recommendation that brings care to a more acceptable and appropriate level of practice or that might prevent an adverse drug event (ADE) of moderate importance; 3) major: intervention might prevent serious morbidity,
including readmission, serious organ dysfunction, serious ADE; 4) extreme: lifesaving; and 5) deleterious: might lead to adverse outcome [14]. Clinical significance of interventions was assessed by an independent panel consisting of one clinical pharmacist and one senior physician. They were from the UK and Australia, with expertise in geriatrics and knowledge of US guidelines (adopted locally). The scale was piloted on a sample of 25 interventions. Written instructions from the pilot were provided to the panel to ease the use of the scale. Panellists had no involvement in the care of patients included in the study. The panel reviewed only interventions accepted by the healthcare team and with direct clinical impact. Significance of each intervention was assessed independently by each panellist. If there was no agreement the panel met to reach consensus on the rating.

Data analysis
Data were analysed using SPSS software (Statistical Package for the Social Sciences, version 17.0). Characteristics of interventions were assessed using descriptive statistics. Level of agreement for classifying DRPs and types of interventions was assessed during the pilot study. The principal investigator and a clinical pharmacist external to the study coded 33 interventions finding a Cohen’s kappa of 0.80 for underlying DRPs and 0.85 for types of interventions. Agreement was considered substantial and almost perfect respectively [28].

Results
Characteristics of participants
Pharmaceutical care was provided to 94 patients. The mean (± SD) age of patients enrolled in the study was 83.3 (± 6.9); 72% were female, 89% were community-dwelling and 16% had ≥1 hospital admission within the previous 6 months. The average length of hospital stay was 8.6 (± 5.4) days. Patients were taking on a regular basis a mean of 4.8 (± 2.0) drugs and the mean number of daily administrations was 6.5 (± 3.3). One administration was defined as the intake of one medicine at a given time during the day (e.g. 1 tablet of X in the morning or 2 tablets of Y in the evening = 1 daily administration) [29].

Interventions by drug type
A total of 740 interventions were made in 94 patients by the clinical pharmacist. The main drug classes (ATC level 2) involved in interventions were antibacterials for systemic use (J01; 11.1%), anti-parkinson drugs (N04; 10.8%), psycholeptics (N05 – including antipsychotics, anxiolytics, hypnotics and sedatives; 10.3%) and analgesics (N02; 9.6%). A comprehensive list of drug classes involved in interventions is shown in Table 2. Intervention details are shown in Table 3. Of the 740 interventions 690 (93.2%) were fully accepted and 611 (82.6%) were assessed for clinical significance by the independent panel as considered to have an impact on clinical care. Overall, the clinical pharmacist made 63.2% (n = 386) interventions of moderate clinical importance and 23.4% (n = 143) interventions of major clinical importance. Type of interventions, their acceptance rate and clinical importance are presented in details in Table 4.

Discussion
A total of 143 interventions of major clinical significance were made over a period of 4 months by a clinical pharmacist in an internal medicine ward. That is equivalent to 35 potential major drug-related problems avoided per month. To our knowledge, this is the first study evaluating the effect of a structured communication strategy on acceptance rate of pharmacist interventions. Pharmaceutical care delivered by the clinical pharmacist is likely to have improved appropriateness of prescribing. The majority of interventions made in our study were either of moderate or major clinical significance.

Both the high acceptance of the pharmacist’s interventions (93.2%) and their clinical significance mean that potential harm to patients was avoided and patients care was improved during their stay in the hospital. Other studies using a similar definition of intervention and similar ways of recording them report an acceptance rate of 76%, 88.4% and 87.8% respectively [14, 16, 17]. The acceptance rate of interventions recorded in our study is higher. Driving forces that have contributed for the high

| Table 2 | Drug classes involved in interventions (N = 740) |
|---------|----------------------------------------------|
| Drug Class (ATC level 2) | Interventions n (%) |
| Antibacterials for systemic use (J01) | 82 (11.1) |
| Anti-parkinson drugs (N04) | 80 (10.8) |
| Psycholeptics (N05) | 76 (10.3) |
| Analgesics (N02) | 71 (9.6) |
| Drugs for acid related disorders (A02) | 68 (9.2) |
| Drugs used in diabetes (A10) | 65 (8.8) |
| Lipid modifying agents (C10) | 60 (8.1) |
| Vitamins (A11) | 41 (5.5) |
| Psychoanalectics (N06) | 38 (5.1) |
| Beta blocking agents (C07) | 33 (4.5) |
| Antianemic preparations (B03) | 19 (2.6) |
| Diuretics (C03) | 18 (2.4) |
| Antithrombotic agents (B01) | 15 (2.0) |
| Calcium channel blockers (C08) | 10 (1.4) |
| Drugs for obstructive airway diseases (R03) | 10 (1.4) |
| Cardiac therapy (C01) | 6 (0.8) |
| Miscellaneous | 48 (6.5) |
Table 3 Characteristics of interventions \((N = 740)\)

| Drug-related problem                          | Interventions \(n\) (%) | Drugs involved                                                                 |
|-----------------------------------------------|-------------------------|-------------------------------------------------------------------------------|
| No specific problem*                         | 118 (15.9)              | antibacterials for systemic use, psycholeptics, drugs used in diabetes, diuretics |
| Prescription writing error                   | 89 (12.0)               | beta blocking agents, anti-parkinson drugs, psycholeptics                      |
| Inappropriate follow-up                      | 83 (11.2)               | drugs used in diabetes, psychoanalectics, drugs for acid related disorders, calcium channel blockers |
| Less costly alternative                      | 74 (10.0)               | drugs for acid related disorders, lipid modifying agents, psycholeptics, vitamins |
| Error in medication history                  | 72 (9.7)                | anti-parkinson drugs, analgesics, beta blocking agents                           |
| Wrong dose                                   | 66 (8.9)                | cardiac therapy (digoxin), drugs used in diabetes, vitamins, beta blocking agents |
| Underuse                                     | 54 (7.3)                | anatemic preparations, lipid modifying agents                                  |
| Inappropriate choice of medicine             | 37 (5.0)                | antibacterials for systemic use, antithrombotic agents, psycholeptics         |
| Inappropriate modalities of administration* \(2\) | 36 (4.9)                | antibacterials for systemic use, analgesics                                    |
| Drug-drug interaction                         | 20 (2.7)                | Analgesics                                                                     |
| Adverse drug reaction suspected or confirmed* \(4\) | 16 (2.2)                | psycholeptics, psychoanalectics                                               |
| Duplication                                  | 15 (2.0)                | drugs for acid related disorders, drugs for obstructive airway diseases        |
| Inappropriate duration of therapy            | 12 (1.6)                | Vitamins                                                                       |
| No valid indication                          | 12 (1.6)                | Miscellaneous                                                                  |
| Modalities of administration not practical for the patient | 8 (1.1)  | Miscellaneous                                                                  |
| Drug-disease interaction (including allergy) | 6 (0.8)                 | Miscellaneous                                                                  |
| Other*                                       | 22 (3.0)                | Miscellaneous                                                                  |

*\(1\) No underlying drug-related problem; i.e. the clinical pharmacist is asked a drug-related question by a physician in the absence of a drug-related problem regarding a specific patient
*\(2\) Modalities of administration refer to frequency of administration, time, route and formulation
*\(3\) An adverse drug reaction was defined as a noxious and unintended reaction that occurs at drug doses used in man for prophylaxis, diagnosis or therapy, that could not be linked to another drug-related problem
*\(4\) Psychoanalectics include antidepressants and anti-dementia drugs

acceptance rate of interventions are: aim of the study clearly stated and communicated to healthcare professionals, direct contact with the medical team, nurses and patients, regular presence of the pharmacist on the ward (0.9 full-time equivalent) and pharmacist with appropriate training in clinical pharmacy/pharmacotherapy in the elderly population.

General advice on the use of newer antidiabetics, monitoring of last generation antibiotics and side effects of psycholeptics were frequently asked to the pharmacist.

Table 4 Type, Acceptance Rate and Clinical Significance of Interventions

| Intervention Type                  | \(n\) (%) | Acceptance Rate (%) | Clinical Significance (%)* \(1\) |
|-----------------------------------|-----------|---------------------|----------------------------------|
|                                  |           | Full    Partial*\(2\) | Rejected | Minor | Moderate | Major | Extreme | Deleterious |
| Educate/inform healthcare professional | 151 (20.4) | 96.0   2.6   1.3 | NA      | NA    | NA       | NA    | NA      | NA         |
| Change dose                       | 119 (16.1) | 94.1   3.4   2.5 | 1.0     | 73.7  | 24.6     | 0     | 1.0      | 0          |
| Switch to other drug              | 109 (14.7) | 94.5   3.7   1.8 | 20.2    | 64.2  | 14.7     | 0     | 0.9      |            |
| Discontinue drug                  | 105 (14.2) | 89.5   6.7   3.8 | 16.2    | 59.5  | 21.6     | 2.7   | 0        |            |
| Add a new drug                    | 86 (11.6)  | 93.0   4.7   2.3 | 25.0    | 44.0  | 31.0     | 0     | 0        |            |
| Other*\(3\)                       | 170 (23.0) | 91.8   3.5   4.7 | 4.3     | 72.0  | 23.4     | 0     | 0        |            |
| Total                             | 740 (100) | 93.2   3.9   2.8 | 12.6    | 63.2  | 23.4     | 0.7   | 0.2      |            |

*\(1\) Clinical significance not assessed by the independent panel as intervention triggered by a healthcare professional other than the pharmacist and/or intervention not leading to change in drug therapy
*\(2\) Advice accepted but partially acted upon
*\(3\) Most common intervention types were: monitoring of medications, follow up of medications newly started, advice on form and route of administration of medications and dosage calculations

NA = not applicable; i.e. clinical significance not assessed by the independent panel as intervention triggered by a healthcare professional other than the pharmacist and/or intervention not leading to change in drug therapy.
These advices were classified as interventions in the absence of a specific problem (15.9%), were not related to a specific patient and were triggered by physicians highlighting how the pharmacist was fully integrated within the healthcare team.

Collaboration between nurses/medical staff and clinical pharmacists in providing patient care is a relatively new concept in Italy. Currently hospital pharmacists are not ward based and their role is mainly limited to drug dispensing with provision of limited medicine information. This has represented a key challenge emphasizing the need to increase awareness of the new service implemented and build trust with the ward team in order to promote and show potential benefits of pharmaceutical care.

It is expected that the nature and extent of physician-pharmacist collaboration can vary and it can be both episodic and informal rather than as part of a continuum of care. Research looking at interprofessional collaboration between doctors and pharmacists has found that doctors are reluctant to accept the fact that quality and safety of medicine use can improve using the expertise of pharmacists [13]. In our study we have overcome this significant cultural barrier applying models of communication from the commercial world to a healthcare setting in order to foster trust, active collaboration and teamwork working between the two professions with the ultimate aim of enhancing acceptance rate of interventions.

It is expected that lack of awareness and knowledge on the importance of ward based clinical pharmacy services on improving appropriateness of prescribing could be one of the reasons for rejection of pharmacist interventions [30]. Involving all key stakeholders is key in service implementation. The use of communication tools such as the SWOT analysis, SMART goals and the AIDA model are likely to have had a positive impact on the acceptance rate of pharmacist interventions. The SWOT analysis had the aim of explaining to doctors and nurses the aim of the new service implemented and forecast potential issues the team would potentially face in future. Suggestions from stakeholders were considered when planning implementation of the service. This in turn led to involvement of doctors and nurses from conception of the project making them more likely to support it.

The use of SMART goals allowed the breakdown of the aim of the study in more simple and measurable objectives which in turn increased awareness of doctors and nurses on the role of the clinical pharmacist at ward level. The AIDA model helped delivering results of the project throughout implementation of the service in a timely and efficient way increasing involvement of doctors and nurses. Communication was delivered, in practice, via power point presentations on key clinical topics tailored for the specific audience and attending meetings to update stakeholders on progress of the service being implemented. Information and concepts delivered using these communication tools were then reinforced via email 1 week after the presentation/meeting. Content of meetings and presentations was further reminded to healthcare staff using face to face communication on a daily basis. A monthly email was sent to staff summarizing key topics discussed in the last 30 days and asking for feedback.

The average number of medication per patient on admission was lower than reported in the literature [14, 31]. This was due to the fact that doctors withhold several drugs when patients were admitted and reintroduced them usually within the following 72 h when the patient’s clinical picture was better defined. The clinical pharmacist spent an important part of his time providing ward-based teaching to healthcare professionals. This is the reason we observed a high number of interventions (20.4%) aiming to educate the healthcare team. A cohort study found that 25.8% of elderly had at least one potentially inappropriate medication prescribed [5]. Our study found that 14.2% of interventions aimed at discontinuing one or more medication suggesting the clinical pharmacist contributed to avoid unnecessary prescribing and generated cost savings. Cost savings were also generated by the pharmacist advising less costly alternative (10%) drugs. In our study it was found that one of the main drug classes involved in interventions was psycholeptics (10.3%). The use of these drugs is associated with falls in elderly patients [9] suggesting interventions made by the clinical pharmacist in addressing DRPs caused by psycholeptics had the potential to reduce falls. Our study found that 9.7% of interventions were made to address DRPs related to errors in medication history. A US study showed that 24.2% medication history discrepancies resulted in discrepancies during hospitalisation [32] highlighting that interventions addressing medication history DRPs might have reduced these discrepancies.

The way interventions are communicated between doctors and pharmacists affects acceptance rates. Research has shown that written communication in the form of paper notes or entries into the medical records result in lower acceptance rate of 39–70% [17]. High acceptance rate of 88.4% has been reported when face-to-face communication has been used [16]. These findings are confirmed in our study where interventions either partially accepted or rejected were communicated attaching a pharmacist intervention note to the drug chart and interventions accepted were communicated and discussed with doctors orally.

To our knowledge this is the first study reporting on the introduction of a clinical pharmacist on an acute care
hospital ward in Italy. The trust has been accredited by
The Joint Commission (JC) as academic hospital in 2014
and benefits of the clinical pharmacy service introduced
are in line with patient safety goals required by JC [33].

Our study has provided evidence to policy makers that
a well thought and tailored communication strategy can
have a positive impact on acceptance rate of interven-
tions made by pharmacists. The ward-based clinical
pharmacy model implemented could have a significant
impact on the improvement of healthcare in hospitals.
The service could be implemented within the whole
trust using the same model and trained clinical pharma-
cists should be introduced at ward level. Pharmacoecon-
yony should be a key component in future developments
of clinical pharmacy as cost-effective quality improve-
ments are given priority within healthcare settings [8].

The main strength of the study is that clinical assess-
ment of interventions by an external independent panel
made results of the study more reliable. Furthermore the
substantial level of agreement when coding DRPs and
types of interventions highlights the extent to which the
data collected in the study are correct representations of
the variable measured. Current research shows that ward
pharmacy services like the one described can be success-
fully implemented in countries having low level of clin-
ical pharmacy input within the hospital setting using the
correct communication strategy.

The study had a number of limitations. The service
was implemented by a single clinical pharmacist on a
30 beds acute internal medicine unit. A multicentre
study was not feasible at the time due to funding issues.
The results of the study should be interpreted carefully
due to lack of generalizability. However, we believe the
clinical pharmacy model described can be replicated
elsewhere employing trained staff and the communi-
cation strategy described as we would expect other hospi-
tals have a similar operating health care system. The
study was relevant in our context as aimed at raising
awareness of hospital based clinical pharmacy services
amongst policy makers nationwide. Lack of control and
the employment of one clinical pharmacist in the study
potentially limited interpretation of results. However, we
used an external independent panel to assess inter-
ventions and findings of the study were interpreted and
discussed by the whole research team reducing the risk
of bias. Previous work has shown that clinical pharma-
cists providing pharmaceutical care to inpatients might
improve their health-related quality of life [34] however
this was not measured in our study. Persistence of
interventions after discharge was not assessed due to
lack of time. As clinical pharmacy is patient oriented,
patients’ reported experience of pharmaceutical care
should have been measured using a patient satisfaction
questionnaire.

Conclusions
We believe the communication strategy adopted has in-
creased both trust and collaboration between doctors
and the pharmacist and this has had in turn a positive
impact on acceptance rate of interventions. Pharma-
cetical care delivered by the clinical pharmacist is likely to
have had beneficial outcomes. Clinical pharmacy services
like the one described should be implemented widely to
increase patient safety. We reckon hospital pharmacy
stakeholders should be more proactive and invest in
ward-based clinical pharmacy services as the impact on
patient safety is likely to be immediate. Introduction of
the service is justified by the need to improve appropri-
ateness of prescribing. Clinical pharmacy services like
the one described must be evidence based and employ
staff with appropriate training.

Abbreviations
ADE: Adverse drug event; ADR: Adverse drug reaction; AIDA: Awareness,
interest, desire, action; ATC: Anatomical therapeutic chemical; DRP: Drug-
related problem; JC: Joint Commission; PCT: Primary care team;
SMART: Specific, Measurable, Achievable, Realistic and Timely; SPSS
software: Statistical Package for the Social Sciences; SWOT: Strengths,
Weaknesses, Opportunities and Threats

Acknowledgements
We thank doctors, nurses and healthcare assistants of the internal medicine
1 unit for their commitment and active collaboration during the study. We
thank Dr. Bahareh Abtahi and Dr Azadeh Abtahi for assessing clinical
significance of interventions. Nicola Lombardi would like to thank teaching staff
at University College London School of Pharmacy for providing him with the
skills and knowledge to implement the clinical pharmacy service described.

Funding
Not applicable.

Availability of data and materials
Data is available upon request from the corresponding author.

Authors’ contributions
NL conceived and designed the study, contributed to data collection,
analysed and interpreted data, wrote the first draft of the manuscript, and
created the Tables. LW participated in the discussion and critically revised
the manuscript. MG contributed to study design, participated in the
discussion and critically revised the manuscript. EP and SL contributed to
data collection. PR and MGT participated in the discussion and critically revised
to study design. All authors contributed to the final manuscript. All authors
read and approved the final manuscript.

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Clinical Pharmacy both by University College London School of Pharmacy.

Ethics approval and consent to participate
The study protocol was approved by the Comitato Etico Regionale Unico of
Friuli Venezia Giulia, Italy. All data was anonymous. The need for written
consent was formally waived by the ethics committee.
Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Publisher’s Note
Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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Received: 26 September 2017 Accepted: 13 March 2018

Published online: 10 April 2018

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