CTF WG2 Final Report

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BACKGROUND

In the meeting between EAHP president Petr Horák and the commission (Sophie Weisswange) on May 23th 2018 the commission highlighted that EAHP needs to provide the European Commission with evidence showing the benefit of a hospital pharmacy specialisation for patients.

The CTF WG2 made an comprehensive literature research and published the results in 2016 (Lorna Marie West, Cornelia Vetter-Kerkhoff, Nenad Miljkovic, Roberto Frontini. Is there a need for a hospital pharmacy common training framework? Review of the literature on the impact of educational interventions on health outcome: http://dx.doi.org/10.1136/ejhpharm-2016-001185). Unfortunately the WG2 did not find a clear evidence for specialised pharmacists in the literature. In contrast the evidence of pharmaceutical interventions on patients outcomes is very large.
Thus the WG2 decided to look in such literature more in detail to discover whether additional information on pharmacists education was available in the methods description of the publications (details s. attached list).

METHODS

We examined 70 papers published in peer reviewed journals giving a large evidence on the positive effect of pharmaceutical interventions for patients' outcomes in many fields including internal and acute medicine, oncology, paediatrics und surgery as well demonstrating the beneficial economic effect of such interventions (s. attached list). The aim was to find out whether the papers had information on the qualification of the pharmacists.

RESULTS

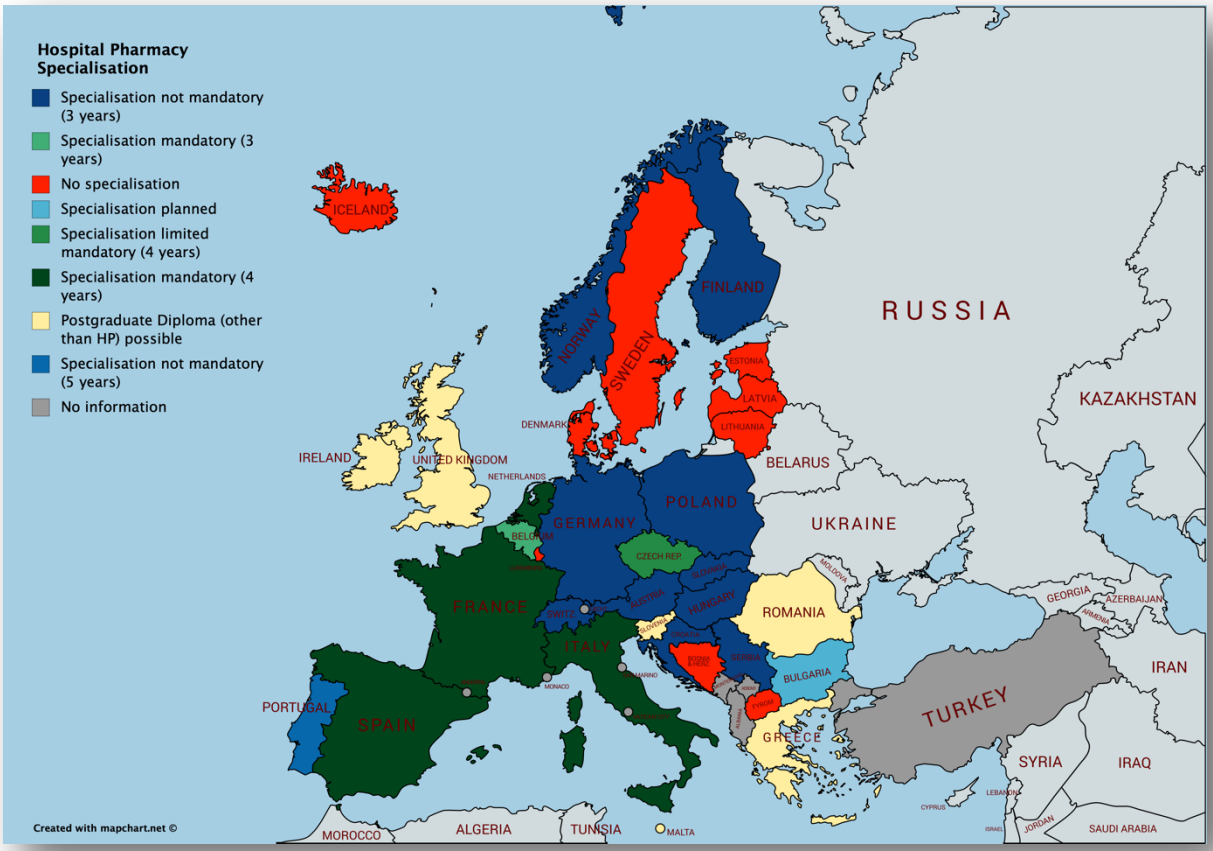
40 (57%) of the papers had information on the qualification of the pharmacists. Additional 7 (10%) had partial information on the qualification. Out of the papers having detailed information on pharmacists' qualifications 30 (43% of all publications) defined the pharmacists as "clinical pharmacists" having additional training. Other qualifications included intensive care-, pain-, oncology-, paediatric-, internal medicine and infectious diseases-specialised pharmacists.

CONCLUSIONS

Literature published in peer reviewed and partially high impact journals gives a clear evidence, that only qualified pharmacists with postgraduate education can provide the right services the patients deserve and consequently improve their outcomes, similarly to other professions (physicians and nurses) in health care system.
In most of the publications additional information on the qualification of the pharmacists involved highlighted their competency in clinical services based on additional training.

ADDITIONAL RECOMMENDATIONS

The scientific evidence may not be of interest for the commission, but a view on the situation of postgraduate education in hospital pharmacy across Europe shows that most of the EU countries believe that specialisation is necessary for an effective performance of pharmacists working in hospitals. The graphic is based on the latest information gathered by EAHP on the base of the answers by its members.



It is important to highlight that Spain, France, The Netherlands and Italy made hospital pharmacy specialisation mandatory for working in hospitals. Cech Republic and Belgium made specialisation mandatory for some functions (e.g. head of pharmacy).
Historically Spain was the first country introducing a mandatory specialisation (**1982** – Real Decreto 2708/1982) followed by Italy (**1992** legge 502/1992, **1997** decreto presidenziale 483/1997). Since introduction no attempt was made to withdraw the regulation showing that authorities recognised the necessity of additional education for hospital pharmacists.
Interesting is also the situation in Finland: Finland's national hospital pharmacy training programme was run by the University of Kuopio in the 1990s. However, the programme was terminated in 2001 because of a lack of resources. In 2006 it was recognised that specialisation was missing and a working group was created. The new hospital pharmacy curriculum is based on that proposal and was developed during 2009–2010 with the financial support of the Ministry of Education (2009) and the University of Helsinki (2010).
The fact that authorities initiated and supported hospital pharmacy specialisation demonstrates that such specialisation is not only a request by pharmacists but has to be considered as an important premise for citizen health.

Paper	Aim of Study	Outcome	Information on Qualification of pharmacists (Y/N)	Type of Qualification or description
Am J Health Syst Pharm. 2003 Mar 1;60(5)473-6.pdf	determine the impact of intensive inpatient counseling (IPC) in asthma patients. Specific goals were to ascertain whether IPC combined with outpa- tient telephone follow-up reduces the combined endpoint of the number of ED visits and hospital admissions for acute exacerbations of asth- ma, to determine if IPC improves adherence after discharge, and (to improve medical care by ensuring that asthma therapy is optimized.	absolute reduction in asthma-related ED visits and hospitalizations of 1.23 per person (p = 0.0016).	no	pharmacist
Am J Health Syst Pharm. 2004 Apr 15;61(8).838, 840.pdf	financial impact of pharmacists interventions	2567 recommendations resulted in a total cost avoidance of $1,472,000	no	pharmacist

Am J Health Syst Pharm. 2006 Dec 15;63(24)2500-3.pdf	identify discrepancies between medication histories taken by emergency department (ED) providers (physicians, nurses, and medical students) and medication histories taken by clinical pharmacists.	The pharmacists identified 1096 home medications versus 817 home medications documented by ED providers. Of the 817 home medications documented by the ED, the regimens of 637 (78%) were incomplete and were supplemented with dosing information by the pharmacists. Pharmacists reported 375 medication allergies versus 350 reported by ED providers	**yes**	**clinical pharmacist**
Am J Health Syst Pharm. 2007 Apr 15;64(8)842-9.pdf	A systematic review and meta- analysis were conducted to determine if studies that included pharmacists as chart reviewers detected higher rates of adverse drug events (ADEs) than studies that in-cluded other health care professionals or hospital personnel as chart reviewers.	The review of the literature revealed that pharmacists make a salient contribution as manual chart reviewers in inpatient ADE interventions.	no	pharmacist
Am J Health Syst Pharm. 2007 Aug 15;64(16)1720-3.pdf	The effect of pharmacist-conducted medication reconciliation on compliance with a hospital's medication reconciliation policy was studied.	Pharmacist-conducted medi-cation reconciliation in the ED increased compliance to the institution's medication reconciliation policy for admitted patients. Pharmacist-acquired medication histories had significantly fewer errors in documen- tation and had more documentation of patient allergies.	no	pharmacist

Am J Health Syst Pharm. 2007 Dec 1;64(23)2483-7.pdf	The cost implications of and potential adverse events prevented by the interventions of a critical care pharmacist were studied.	Among the interventions performed and documented by a clinical pharmacist in an ICU, patient care rounds and chart-review activities were associated with the greatest number of interventions and the greatest potential cost avoidance.	**yes**	**ASHP accredited specialised pharmacist**
Am J Health Syst Pharm. 2007 Jul 15;64(14 Suppl 9).S17-20;	Report on implementation of patients safety initiatives	At this tertiary-care hospital these efforts dramatically decreased the number of major steps in the medication-use process and medica- tion turn-around time, while reducing the rate of harm	**yes**	**spezialased pharmacists (oncology, internal medicine, critical care)**
Am J Health Syst Pharm. 2008 Aug 15;65(16).1560-5.pdf	The implementation of a pain management pharmacy service in a com- munity hospital is described.	The implementation provided pain management services to patients and a valuable resource to other health care staff.	**yes**	**pharmacist attended additional education in pain medication**
Am J Health Syst Pharm. 2008 Oct 1;65(19).1834-40pdf.pdf	Drug administration errors and incompatibilites in catheters in Heidelberg ICU	Errors were frequent but significantly reduced by introducing SOPs developed by clinical pharmacists	**yes**	**clinical (hospital) pharmacist**

Am J Health Syst Pharm. 2009 Aug 1;66(15).1353-61.pdf	A systematic literature review was conducted to ascertain the scope of involvement of clinical pharmacists in the emergency department (ED); summarize economic, humanistic, and clinical out- comes data; describe current limitations of these data; and identify areas for future research.	Services provided by pharmacists in the ED included traditional clinical pharmacy services, responding to medical emergencies, pro- viding consultations on medication issues, identifying and reducing medication er- rors, and conducting medication histories at hospital admission. Some services were shown to be cost saving or cost avoiding.	partially	Critical care pharmacy residents
Am J Health Syst Pharm. 2009 Aug 15;66(16)1484-7.pdf	The role of pharmacists in the emergency department (ED) of an acute care hospital is described.	ED pharmacists at one institu- tion expanded their clinical role by taking on more direct patient care responsibili- ties. Pharmacists' interventions were well received by ED physicians, with an accep- tance rate of 98%.	no	pharmacist
Am J Health Syst Pharm. 2009 Dec 1;66(23)2126-31.pdf	The implementation of a compre- hensive medication reconciliation program to reduce errors in admission and discharge medication orders at an academic medical center is described.	A pharmacy-driven multidis- ciplinary admission history and medication reconciliation process has reduced medica- tion errors	yes	pharmacy student or intern with subsequent verification by a pharmacist

Am J Health Syst Pharm. 2010 Oct. 1;67(19)1624-34.pdf	A systematic review examining the economic effects of pharmacist-provided direct patient care on health out- comes in the United States was conducted	A majority of studies examin-ing the economic effects of pharmacist- provided direct patient care in the United States were limited by their partial cost analyses, study design, and other analysis considerations. A majority of the 20 stud- ies that found positive economic benefits examined pharmacists' interventions in- volving technical methods or multimodal approaches.	no	pharmacist
Ann Emerg Med. 2010 Jun;55(6)513-21. Epub 2009 Dec 11.p	the impact of emergency department (ED) pharmacists on reducing potentially harmful medication errors.	ED pharmacists can identify and prevent potentially harmful medication errors.	**yes**	**trained pharmacy residents**
Ann Intern Med. 2009 Sep 15;151(6)JC3-14.pdf	In patients ≥ 80 years of age who are admitted to an acute inter- nal medicine ward, does a comprehensive pharmacist intervention reduce subsequent hospital visits?	reduced overall hospital visits, emergency department visits, and drug-related readmissions but not affect overall readmissions or survival	no	pharmacist
Arch Intern Med. 1999 Oct 25;159(19)2306-9.pdf	assess the impact of pharmacist-initiated interventions on cost savings.	interventions solely aimed at reducing costs represent a small portion of a pharmacist's activities.Significant savings for an institutionas outcome.	**yes**	**certified pharmacotherapy specialists**

Arch Intern Med. 1999 Sep 13;159(16)1939-45.pdf	Evaluation of the role of a clinical pharmacist in treating heart failure	Outcomes in heart failure can be im- proved with a clinical pharmacist as a member of the mul- tidisciplinary heart failure team. This observation may be due to higher doses of angiotensin-converting en- zyme inhibitors and/or closer follow-up.	**yes**	**clinical pharmacist**
Arch Intern Med. 2003 Aug 11-25;163(15)1813-20.pdf	Evaluation of collaborative care in drug management of patients with low- or high-risk coronary heart disease	The decisions made by pharmaceutical care practitioners working in collaboration with physicians to provide drug therapy management services are clini- cally credible based on the evaluations and comments of a peer review panel.	**yes**	**Three pharmaceutical care practitioners in the Fairview system hold doctorate degrees in pharmacy, 3 oth- ers hold bachelors' degrees in pharmacy, and their total experience as pharmacists ranges between 3 and 21 years (mean, 12 years). Two pharmacists completed postgradu- ate residency programs, and 1 is a Board-Certified Pharmacotherapy Specialist.Pharmacists complete a 120-hour, 8-week, 50- patient certificate preparation program in pharmaceuti- cal care**
Arch Intern Med. 2003 Sep 22;163(17)2014-8.PDF	The objec- tives of this study were to evaluate the impact of having a pharmacist participate with a physician rounding team on preventable ADEs in general medicine units and to document pharmacist interventions made during the rounding process.	Pharmacist participation with the medical rounding team on a general medicine unit contributes to a significant reduction in preventable ADEs.	yes	bachelor of science

Arch Intern Med. 2007 May 28;167(10)1034-40.pdf	This study measures the reduction of medication discrepan- cies associated with a combined intervention of struc- tured pharmacist medication history interviews with assessments in a surgical preadmission clinic and a postoperative medication order form.	A combined intervention of pharmacist medication assessments and a postoperative medica- tion order form can reduce postoperative medication discrepancies related to home medications.	no	pharmacist
Arch Intern Med. 2009 May 11;169(9)894-900.pdf	The objective of this study was to investigate the effectiveness of interventions performed by ward-based pharmacists in reducing morbidity and use of hospital care among older patients.	If implemented on a population basis, the addition of pharmacists to health care teams would lead to major reductions in morbidity and health care costs.	yes	**postgraduated course in clinical pharmacy**
Arch Intern Med. 2010 October 11;170(18)1634-1639.pdf	We sought to describe the effect of pharmacist-physician comanagement of hypertension on 24-hour ambulatory blood pressures (BP).	Pharmacist-physician collaborative man- agement of hypertension achieved consistent and sig- nificantly greater reduction in 24-hour BP and a high rate of BP control.	no	clinical pharmacist
Basic Clin Pharmacol Toxicol. 2008 Mar;102(3)275-80. Epub	Study seeks to evaluate the clinical pharmacist's interventions in a Cardiac-Surgery ICU setting with regard to their acceptance by the medical team, rate, clinical significance, and targeted patient's outcomes.	The clinical pharmacist interve	Yes	Clinicial pharmacist

Br J Clin Pharmacol. 2008 Mar;65(3).303-16. Epub 2007 Dec	We set out to determine the effects of pharmacist-led medication review in older people by means of a systematic review and meta-analysis covering 11 electronic databases.	We retrieved 32 studies which fitted the inclusion criteria.Meta-analysis of 17 trials revealed no significant effect on all-cause admission, relative risk (RR) of 0.99 [95% confidence interval (CI) 0.87, 1.14, P = 0.92], with moderate heterogeneity (I2 = 49.5, P = 0.01).Meta-analysis of mortality data from 22 trials found no significant benefit, with a RR of mortality of 0.96 (95% CI 0.82, 1.13, P = 0.62), with no heterogeneity (I2 = 0%). Pharmacist-led medication review may slightly decrease numbers of drugs prescribed (weighted mean difference = -0.48, 95% CI -0.89, -0.07), but significant heterogeneity was found (I2 = 85.9%, P < 0.001)	Yes	Clinical pharmacist/Hospital pharmacist/Community pharmacist/Research (Specialist) pharmacist

Clin J Oncol Nurs. 2007 Oct;11(5)687-95.pdf	This study aimed to evaluate the attitudes and knowledge of inpatient oncology healthcare providers toward pain management by surveying nurses, pharmacists, and physicians working on the inpatient oncology units at an academic medical center.	Healthcare providers generally reported positive attitudes toward pain management but were deficient in their knowledge of pain management. The authors suggest that pharmacists become more integral members of palliative care teams and actively participate in rounds. A need exists for educational programs in pain management for healthcare providers, especially for those who do not routinely care for patients with cancer.	No	Pharmacist
Clin Transplant. 2001 Oct;15(5)330-6.pdf	This randomized, controlled trial evaluates the impact of clinical pharmacy services on renal transplant patients' compliance with immunosuppressive agents.	The mean Compliance rate (CF	Yes	Clinical Pharmacist

CMAJ. 2004 Feb 3;170(3)333.PDF	The assessment of the impact of including pharmacists on rounding teams in non-ICU settings.	Pharmacists provided 150 interventions during the rounding process, 147 of which were accepted by the physicians. The most common interventions involved recommendations for dosage or frequency adjustments and for the addition of an indicated drug. There were 11 preventable adverse drug events: 2 in the study group and 9 in the control group ($p = 0.02$). The reliability of the reviewers for identifying such events was high ($\kappa = 0.71–0.87$). The length of stay, drug charges and readmission rates did not differ significantly between the 2 groups.	No	Pharmacist

Cochrane Database Syst Rev. 2005 Oct 19;(4).CD003543.pdf	To estimate the effectiveness of professional interventions that alone, or in combination, are effective in promoting prudent antibiotic prescribing to hospital inpatients, to evaluate the impact of these interventions on reducing the incidence of antimicrobial resistant pathogens or CDAD and their impact on clinical outcome.	The results show that interventions to improve antibiotic prescribing to hospital inpatients are successful, and can reduce antimicrobial resistance or hospital acquired infections.	No	Pharmacist

Crit Care Med. 2001 Apr;29(4 Suppl)N108-13.pdf	This review will address the many issues that surround the appropriate use of antibiotics and what role the pharmacist can play in ensuring the optimal use of infection control measures in the ICU and hospital.	Clinical pharmacists also play an integral role in controlling bacterial antibiotic resistance. Pharmacists are involved in identifying patients and developing protocols for isolation precaution and vaccination. They are involved in resistance surveillance and in determining antibiotic choices based on local and national susceptibility patterns. They contribute to the appropriate use of antimicrobials, antimicrobial use optimization, and specialized programs such as antimicrobial cycling. The pharmacist provides a unique set of skills to the effort of controlling microbial resistance	Yes, partially	Pharmacists/Clinical pharmacists

Crit Care Med. 2002 Apr;30(4)919-21.pdf	To study the impact of a clinical pharmacist in a pediatric intensive care unit. The goals of the study were to determine the type and quantity of patient care interventions recommended by a clinical pharmacist and to specifically examine cost savings (or loss) that resulted from clinical pharmacist recommendations.	There were 35 recommendations per 100 patient days. The most common interventions were dosage changes (28%), drug information (26%), and miscellaneous information (22%). The average time spent per day by the clinical pharmacist in the pediatric intensive care unit was 0.73 hrs or 0.02 full-time equivalent. The total cost direct savings for the study period was $1,977. Extrapolated to direct cost savings per year, the total amount saved was $9,135/year or 0.15 full-time equivalent.	Yes	Clinical pharmacist
Crit Care Med. 2006 Mar;34(3 Suppl)S46-51.pdf	To review the history, training requirements, contributions to patient care outcomes, and workforce issues of critical care pharmacists.	Critical care pharmacists are considered essential members of the multiprofessional ICU team, as a result of contributions to medication safety, improved patient outcomes, and reduced drug costs and as a source of drug information and provider of education.	Yes	Clinical/Critical Care Pharmacist (PhD and up to 2 years of postdoctorate residency training-Board Certified Pharmacists)

Crit Care Med. 2008 Dec;36(12)3184-9.pdf	To determine whether the absence or presence of clinical pharmacists in intensive care units (ICUs) results in differences in mortality rates, length of ICU stay, and ICU charges.	In summary, this is the first study to demonstrate that the services provided by clinical pharmacists in caring for critically ill patients with infections are associated with lower ICU mortality, shortened ICU stay, and reduced charges.	Yes	Clinical pharmacist
Crit Care Med. 2008 Dec;36(12)3269-70.pdf	To assess if the presence of a clinical pharmacist in the intensive care team is associated with a highly significant reduction in mortality, length of stay, and costs of care.	The presence of a clinical pharmacist in the intensive care team is associated with a highly significant reduction in mortality, length of stay, and costs of care. It can be concluded that 7409 lives could be saved, and that $24.81 in costs are avoided for every dollar invested in clinical pharmacy expertise.	Yes	Clinical pharmacist
Crit Care Med. 2008 Feb;36(2)427-33.pdf	The purpose of this study was to document the impact of daily pharmacist interventions on clinical outcomes of intensive care unit patients prescribed continuous sedative therapy.	The mean duration of mechan	Yes	Clinical pharmacist* olny in the title *The pharmacists involved in the study were either current pharmacy residents or residency trained pharmacists.

Drug Saf. 2007;30(5)379-407.pdf	A search of the literature between 1990 and 2005 was conducted in order to retrieve the relevant original publications reporting the frequen-cy of medication errors and/or adverse drug reactions in hospitalised patients. From these data, we extracted the frequency and the risk factors for these drug-related problems, in order to he able to propose suitable measures for their reduction.	Since medication errors are st	Yes	Clinical pharmacist
Emerg Infect Dis. 2006 Feb;12(2).211-6.pdf	To identify rigorous evaluations of interventions to improve hospital prescribing of antimicrobial drugs by a literature review.	We identified 66 studies with	No	No description provided on healthcare professionals.

Farm Hosp. 2006 Nov-Dec;30(6)328-42.pdf	To assess the efficacy of a multifactorial educational intervention carried out by a pharmacist in patients with heart failure (HF).	The patients of the intervention group had a higher level of treatment compliance than the patients in the control group. At 12 months of follow-up, 32.9% fewer patients in the intervention group were admitted again vs. the control group. The mean days of hospital stay per patient in the control group were 9.6 (SD = 18.5) vs. 5.9 (SD = 14.1) in the intervention group. No differences were recorded in quality of life, but the intervention group had a higher score in the satisfaction scale at two months [9.0 (SD = 1.3) versus 8.2 (SD = 1.8) p = 0.026].This study demonstrates that a postdischarge educational intervention in patients with heart failure, carried out by a	No	Pharmacist

Int J Antimicrob Agents. 2008 Jun;31(6).511-7. Epub 2008 M	The aims of this literature review were: (i) to determine what roles have been supported by evidence for the pharmacist in optimising antimicrobial treatment as part of an antimicrobial multidisciplinary team (AMDT) in secondary care; and (ii) to describe the outcomes of interventions of an AMDT in secondary care with pharmacy involvement.	The hospital pharmacist emerged as a key member of the AMDT. The dispensary pharmacist was mainly involved in the screening processes andwas crucial in implementing restriction policies. The generalward-based clinical pharmacistwas involved in guideline development, formulary management, intravenous-to-oral conversions and evaluations of programme outcomes through monitoring of drug usage, and also facilitated identification of patients with specific needs who could be referred to the specialist pharmacist. A role emerged for the specialist pharmacist who was an integral part of the AMDT and was involved in activities including reviewing of more complex	Yes	Clinical pharmacist/Hospital pharmacist/Dispensary pharmacist/

Intensive Care Med. 2003 May;29(5)691-8. Epub 2003 Mar 2	The purpose of this article is to review the literature pertaining to pharmacists' contributions within a multidisciplinary intensivist led intensive care unit (ICU) team.	Pharmacist involvement in improving clinical outcomes of critically ill patients is associated with optimal fluid management and substantial reductions in the rates of adverse drug events, medication administration errors, and ventilator-associated pneumonia. Furthermore, economic evaluations of clinical pharmacy services in the ICU consistently reveal the potential for considerable cost savings.	No, partially	Pharmacist/Critical care pharmacist
Intensive Care Med. 2006 Apr.32(4).511-5. Epub 2006 Feb 1	The study to look into the return on investment (ROI) provided by a part-time pharmacist employed in a hospital.	The difference in savings gaine	Yes	Clinical pharmacist
Intensive Care Med. 2006 Aug;32(8)1275-6; author reply 12	Questioning the Hartmann and Meier-Hellmann novel approach as a potential method of increasing the return on investment of the intensive care pharmacist.	Proactive interventions are far more effective than reactive interventions.The impact that clinical pharmacists have is difficult to quantitate, as well as quantify. Hartmann and Meier-Hellmann describe a comparison of one week of bedside rounds to three weeks of an electronic consultation, not even a fair time comparison.	Yes	Clinical pharmacist

J Am Geriatr Soc. 2005 Nov;53(11)1912-20.pdf	To develop, implement, and evaluate a pharmacist-led multidisciplinary intervention in a hospital setting that would optimize antithrombotic use in elderly atrial fibrillation patients.	This pharmacist-led multidisciplinary intervention produced significant changes in the use of antithrombotic therapy within this patient sample. Specifically, the review process achieved a significant increase in the proportion of patients receiving antithrombotic therapy (particularly aspirin) when compared with the baseline (admission) usage; a small (but statistically insignificant) decrease in the proportion of patients receiving warfarin, after having efficiently identified patients at-risk of misadventure.	Yes, partially	Clinical pharmacist developed the tools, study itself was conducted by a project pharmacist (qualification was not mentioned)
J Am Osteopath Assoc. 2002 Dec;102(12)678-81.pdf	As the healthcare system is faced with the challenge of reducing medication errors and adverse drug events, one viable solution may be to increase physician pharmacist collaboration.	According to the recent literat	Yes	Clinical pharmacist/Hospital pharmacist

J Clin Microbiol. 2008 Jul;46(7)2381-3. Epub 2008 May 7.PDI	To assess if the use of an infectious disease (ID) clinical pharmacist to alert physicians and to provide clinical recommendations on specific antimicrobial therapy at the time of mecA gene test result availability would decrease the time to receipt of optimal antimicrobial therapy (OAT) against S. aureus infections.	Pharmacist intervention on the basis of the results of the mecA gene test resulted in a 25.4-h reduction in the time of receipt of OAT and a trend toward a decrease in the duration of S. aureus bacteremia. These results may result in decreased morbidity and mortality in patients with S. aureus bacteremia.	Yes	Infectious disease (ID) Clinical pharmacist
J Eval Clin Pract. 2009 Apr;15(2).266-75.pdf	This study explores pharmacist's decision-making processes for adverse drug event (ADE) detection.	Pharmacists used a forward re	Yes	Clinical pharmacist
J Interprof Care. 2009 Mar;23(2)169-84.PDF	This study was used to explore the nature and extent of the collaborative working relationships the physicians, nurses and pharmacists developed during the study period. The meaning of study participants' experiences and the effectiveness of the interaction that resulted between them were two key elements that were investigated in this study.	Pharmacists experienced highs	Yes	Clinical pharmacist

J Oncol Pharm Pract. 2006 Jun;12(2)75-81.pdf	The aim of this project was to establish the importance of a pharmacist in the health-care team in improving drug use in an oncology ward in the Department of Oncology, Karolinska University Hospital, Stockholm, Sweden.	In total, 114 Drug Related Prob	No	Pharmacist (although postgraduate courses in hospital pharmacy including a clinical pharmacy course, existing in Sweden in 2006 mentioned in the text)
J Qual Clin Pract. 2001 Dec;21(4).99-103.pdf	Selected clinical pharmacy interventions undertaken during a 30-day data capture period were analysed, seeking to gain a greater understanding of the nature of the drug-related problems involved.	The most common category of	Yes	Clinical pharmacist
JAMA. 1995 Jul 5;274(1)29-34.pdf	To assess incidence and preventability of adverse drug events (ADEs) and potential ADEs. To analyze preventable events to develop prevention strategies.	42% of AEDs were preventable, compared with 18% of significant ADEs. Errors resulting in preventable ADEs occurred most often at the stages of ordering (56%) and administration (34%); transcription (6%) and dispensing errors (4%) were less common. Errors were much more likely to be intercepted if the error occurred earlier in the process: 48% at the ordering stage vs 0% at the administration stage.	no	pharmacist

JAMA. 1995 Jul 5;274(1)35-43.pdf	To identify and evaluate the systems failures that underlie errors causing adverse drug events (ADEs) and potential ADEs.	When hospital personnel were given the opportunity, they found that they were quite capable of identifying system malfunctions that led to errors and of redesigning the systems.	extensive educatic	academically based pharmacists
JAMA. 1999 Jul 21;282(3)267-70. Erratum in JAMA 2000 Ma	To measure the effect of pharmacist participation on medical rounds in the ICU on the rate of preventable adverse drug events (ADEs) caused by ordering errors.	participation of a pharmacist on medical rounds can be a powerful means of reducing the risk of ADEs and cost.	no	experienced senior pharmacist
JAMA. 1999 Jul 21;282(3)267-70.PDF	Letter to the editor JAMA. 1999 Jul 21;282(3)267-70. Erratum in JAMA 2000 Mar 8;283(10)1293.PDF	N/a	N/A	They highlitghed: 'it would be beneficial to know if the study and control pharmacists had comparableexperience and training.' Answer: it was comparable.
Med Care. 2001 Feb;39(2)113-22.pdf	The objective of this study was to determine whether ambulatory care clinical pharmacists could affect HRQOL in veterans who were likely to experience a drug-related problem.	clinical pharmacists had no significant impact on HRQOL as measured by the SF-36 for veterans at high risk for medication-related problems	no	clinical pharmacist

Med Care. 2009 Jun;47(6)642-50.pdf	to determine whether collaborative care including a team-based clinical pharmacist improves the quality of prescribed drug therapy and reduces hospital readmission.	The primary outcome was the overall quality score measured retrospectively by a blinded chart reviewer using 20 indicators targeting 5 conditions. Secondary outcomes included 3- and 6-month readmission.	yes	Both team-based pharmacists had a Bachelor of Science in Pharmacy degree, had completed a 1-year hospital pharmacy residency and had practiced as hospital-based clinical pharmacists prior to participating in this study. One team-based pharmacist had 8 years of practice experience in an intensive care unit, whereas the other had a total of 5 years of experience in intensive care and internal medicine settings. A series of education sessions led by local pharmacist experts (1 on each target disease state and 1 on documentation of clinical care activities), was conducted with the team-based pharmacists prior to commencing the study.
Med Care. 2010 Oct;48(10)923-33.pdf	to conduct a comprehensive systematic review with focused meta-analyses to examine the effects of pharmacist-provided direct patient care on therapeutic, safety, and humanistic outcomes.	Studies selected included those reporting pharmacistprovided care, comparison groups, and patient-related outcomes.	yes	because of their education and specialized training, pharmacists offer clinical expertise, unique insights, and beneficial recommendations regarding medication use/monitoring and patient management that result in improved therapeutic, safety, and humanistic outcomes, and may contribute to more cost-effective health care. 2. Pharmacists who perform direct patient care services (also known as clinical pharmacists in many settings) are specially trained to monitor medication therapy with the goals of achieving desired therapeutic outcomes and reducing adverse health events.

Neurosurgery. 2009 Nov;65(5)946-50; discussion 950-1.pdf	brief quantitative analysis of the benefit provided by a clinical pharmacist in a multidisciplinary neurosurgical setting.	cost per patients, average hospital stay, hospital mortality, readmission rate	yes	clinical pharmacist with critical care training, critical care residency trained pharmacist with a Doctor of Pharmacy degree. The additional experience that postgraduate pharmacy residency training provides is an invaluable step toward achieving the knowledge base and professional training necessary in this area and should become a requirement.
Palliat Med. 1997 May;11(3)209-16.pdf	to evaluate retrospectively the contribution of the pharmacist. to identify the number and nature of the interventions, their clinical significance, the degree of acceptance by the medical staff, and their potential for cost-savings	a validated six-point system for assessing pharmacist interventions.	no	This survey emphasizes the role of liaison clinical pharmacists in palliative care, the need for much more critical appraisal of prescribing practices and the utility of ranking pharmacist interventions as a quality assurance and educational tool. In particular, providing palliative care for patients with advanced acquired immunodeficiency syndrome (AIDS) is enhanced when a pharmacist with a specialist knowledge of AIDS therapeutics is available.
Pediatr Cardiol. 2008 Jul;29(4)744-8. Epub 2007 Dec 14.pdf	to identify the medications in the pediatric cardiac ICU that most frequently require adjustment for renal dysfunction, (2) to characterize the population of patients requiring medication adjustment secondary to renal insufficiency, and (3) to characterize pharmacist consultation for adjustment of medications due to renal insufficiency in the pediatric cardiac ICU.	cost of care, medication errors, and optimize medical therapies via several types of activities.	no	pharmacist

Pediatrics. 2007 Jan;119(1)e77-85.pdf	to characterize medication errors and adverse drug events intercepted by a system of pediatric clinical pharmacists and to determine whether the addition of a computerized physician order entry system would improve medication safety.	medication error rate	yes	clinical pharmacists with specialized training in pediatrics
Pharm World Sci. 2000 Apr;22(2)33-8.pdf	to investigate the benefits of a community services liaison pharmacist	medication related problems; GP and community pharmacist opinions of the service	no	They made distinct between community and clinical pharmacist.
Pharm World Sci. 2007 Jun;29(3).146-63. Epub 2007 Feb 2.p	To identify and review the clinical and economic impact of pharmacists' interventions (one of them is education!) on antibiotic use.	appropriateness of prescribing, costs ,length of hospital stay, therapy related issues	no/partially	two of reviewed articles with education alone and one with combination with policy showed statistically significant benefits. The use of practice guidelines or educational strategies demonstrated a positive impact on either economic or clinical outcomes.
Pharm World Sci. 2009 Jun;31(3) 373-9. Epub 2008 Nov 29.p	To determine the frequency and clinical significance of medication errors when (a) pharmacists elicit medication histories in the Emergency Department after medications have been prescribed by doctors and (b) pharmacists obtain and chart medication histories prior to doctors' approval.	Frequency of unintentional discrepancies and medication errors.	no	pharmacist
Pharm World Sci. 2010 Apr;32(2).194-9. Epub 2010 Jan 19.p	To evaluate pharmaceutical interventions by ward-based clinical pharmacists in Germany.	Classification of (1) cause of intervention, (2) intervention, (3) outcome of intervention and (4) initiator of intervention.	yes	They have advanced training in the field of clinical pharmacy.

Pharm World Sci. 2010 Feb;32(1)7-18. Epub 2009 Dec 11.pd	to summarise the available evidence regarding the role and impact of clinical pharmacy services in the care of solid organ transplant patients.	A search of the literature was conducted to identify studies relevant to investigation of the impact of clinical pharmacists' interventions.	yes	Clinical pharmacists' in-depth education in pharmacotherapy empowers them to address the complexity of the issues associated with the care of transplant patients, such as the management of an immunosuppressant regimen, ADEs, DDIs, medication compliance issues and the management of infectious diseases. Other transplant-related roles in which clinical pharmacists participate include education, the development of practice guidelines and quality outcomes monitoring.
Qual Saf Health Care. 2005 Jun;14(3)207-11. Erratum in Qu	the study sought to assess the impact of the pharmacist on the Post-Take Ward Rounds on prescribing (including drug histories), drug expenditure, and medication associated risks.	there was a retrospective review of risk, cost and potential savings, changes from preadmission drug history, difference in medication costs between admission and discharge were calculated	no	pharmacist/ cinical pharmacist
Qual Saf Health Care. 2006 Feb;15(1)23-31.pdf	To identify and evaluate studies of interventions in primary care aimed at reducing medication related adverse events that result in morbidity, hospital admission, and/or mortality.	All interventions applied in primary care settings which aimed to improve patient safety by reducing adverse events resulting from medication overuse or misuse were considered.	no	primary care
Saudi Med J. 2008 Feb;29(2)277-81.pdf	To evaluate clinical pharmacist interventions.	ratio of drug related porblems and interventions.	no	clinical pharmacist
Transplant Proc. 2008 Sep;40(7)2319-23.pdf	to investigate the effects on treatment outcomes by clinical pharmacists joining renal transplant clinics to provide pharmaceutical care.	acceptance of pharmacist recommendations and impact on treatment outcomes.	no	clinical pharmacist
Research in Social & Administrative Pharmacy (2018), doi: h	Review of effectiveness and cost effectiveness of pharmacists interventions	Low quality of studies with some evidence of better outcomes	partially	**experienced or specialised pharmacists**

Farmacia Hospitalaria 2018,Vol. 42 l No 6 l 217 - 218	Review of literature demostrating the positive outcomes by clinical pharmacists	Positive effects in hospital emergency departement, for elderly and internal medicine	**yes**	**specialased pharmacists**