UNIVERSITÉ DE NANTES
UFR SCIENCES PHARMACEUTIQUES ET BIOLOGIQUES

ANNÉE 2021 **N° 2021-125**

MÉMOIRE
DU DIPLÔME D'ÉTUDES SPÉCIALISÉES DE PHARMACIE HOSPITALIÈRE

Soutenu devant le jury interrégional

Le *16 Septembre 2021*

Par *Anthony SOURISSEAU*

Conformément aux dispositions du Décret n° 2012-172 du 3 février

THÈSE
POUR LE DIPLÔME D'ÉTAT DE DOCTEUR EN PHARMACIE

REVUE SYSTÉMATIQUE DES INTERVENTIONS, DES OUTCOMES MESURÉS ET DE L'IMPACT DES ACTIVITÉS DE PHARMACIE CLINIQUE ONCOLOGIQUE À L'HÔPITAL

Présidente :	**Madame Sonia Prot-Labarthe,** Professeur des universités - Praticien Hospitalier en Pharmacie clinique, CHU de Nantes
Directeur de thèse :	**Monsieur Jean-François Huon,** Maître de Conférences Universitaire – Praticien Hospitalier en Clinique, CHU de Nantes
Membres du jury :	**Madame Clémentine Fronteau,** Docteur en pharmacie, Praticien Hospitalier, CHU de Nantes **Monsieur Mathieu Boulin,** Professeur des universités - Praticien Hospitalier en Pharmacie Clinique, CHU Dijon Bourgogne **Monsieur Nicolas Serandour,** Docteur en pharmacie, Praticien Hospitalier, CHU de Nantes

REMERCIEMENTS

A Madame le Professeur Sonia Prot-Labarthe

De me faire l'honneur de juger ce travail et présider ce jury.

A Monsieur le Docteur Jean-François Huon

Pour avoir été autant disponible pour l'encadrement de ce travail et plus généralement durant toutes ces études. Tes qualités humaines et professionnelles sont précieuses.

A Monsieur le Professeur Mathieu Boulin

Pour avoir accepté mon invitation et me faire l'honneur d'être présent aujourd'hui pour juger ce travail

A Madame le Docteur Clémentine Fronteau

Pour m'avoir accueilli chaleureusement lors de mon premier stage à l'hôpital et d'être ici pour évaluer cette thèse mettant un terme à ce cursus.

A Monsieur le Docteur Nicolas Serandour

De me faire l'honneur de faire partie de mon jury mais également pour m'avoir encadré durant un semestre avec bienveillance et gentillesse.

A ma famille

Que je remercie pour m'avoir aidé à en arriver là et particulièrement à ma grand-mère MC à qui je dois beaucoup.

Aux Zombs

On peut parler d'une famille quand on apprécie autant humainement chaque membre qui la compose. Je n'en serais pas là sans vous et je ne vous remercierai jamais assez pour tout ce que vous m'avez apporté durant ces années inoubliables.

A l'équipage

Pour avoir eu le cran de me laisser une capitainerie aussi longtemps.

A la corpo

Pour m'avoir donné l'occasion de rencontrer pleins de copains de l'extérieur en AG, WEI, RP, et avoir pu exercer un poste à haute responsabilité en tant que VP R.I.E.N.

A la faculté de Nantes et à la Scierie

Fantastiques lieux de rencontre et notamment de la promo 2018, fleuron de la pharmacie Nantaise (et merci au passage à Teddy pour le temps que tu as consacré à m'aider pour la correction).

A tous mes co-internes

Cela a été un véritable plaisir de travailler avec vous, j'espère avoir été un aussi bon compagnon de labeur que vous avez tous pu l'être !

A Margaux

Pour tout ce que nous avons partagé ensemble.

TABLE DES MATIÈRES

LISTE DES ABREVIATIONS

BMQ	Beliefs about Medicines Questionnaire
CLEO	Clinical Economic and Organizational
CONSORT	Consolidated Standards of Reporting Trials
CVI	Customer satisfaction Value Index
EORTC QLQ-C30	European Organisation for Research and Treatment of Cancer-Quality of Life Questionnaire
Eq5D	EuroQol
ETP	Éducation Thérapeutique du Patient
GAD-7	Generalized Anxiety Disorder
ISMP	Institute for Safe Medication Practices
IV	Intraveineux
KAP	Knowledge, Attitude and Practices
MAI	Medication Appropriateness Index
MPR	Medication Possession Rate
NCC MERP	National Coordinating Council for Medication Error Reporting and Prevention
NCI-CTCAE	National Cancer Institute's Common Terminology Criteria Adverse Events
PCNE DRP	Pharmaceutical Care Network Europe Drug Related Problem Classification Tool
PHQ-9	Patient Health Questionnaire

PO	Per Os
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
QALY	Quality-Adjusted Life Year
SPIDER	Sample, Phenomenon of Interest, Design, Evaluation, Research type
START	Screening Tool to Alert to Right Treatment
STOPP	Screening Tool of Older Person's Prescription
WHOQOL-BREF	World Health Organization Quality Of Life

INTRODUCTION

« L'utilisation optimale du jugement et des connaissances pharmaceutiques et biomédicales du pharmacien, dans le but d'améliorer l'efficacité, la sécurité, l'économie et la précision selon lesquelles les médicaments doivent être utilisés dans le traitement des patients » [1].

Voici comment le terme de pharmacien clinicien a été décrit initialement dans les années 60 aux États-Unis par Charles Walton.

Le domaine de l'oncologie donne lieu à une prise en charge médicamenteuse complexe et diversifiée, où le pharmacien joue un rôle essentiel notamment grâce à sa vision transversale de cette prise en charge.

La recherche dans le domaine de la pharmacie clinique oncologique a donc fait l'objet de nombreuses publications et ce travail a pour objectif d'analyser et synthétiser ces études grâce à une revue systématique de la littérature que nous avons menée. Cette thèse aura pour objectif de répondre à 3 questions :

- Quelles activités de pharmacie clinique en oncologie sont mises en place ?
- Quels indicateurs sont sélectionnés pour évaluer ces activités ?
- Quels impacts sont mis en évidence à la suite de ces activités ?

Ce manuscrit sera rédigé sous un format « article » ayant été soumis à l'*International Journal of Clinical Pharmacy*. Une discussion suit l'article, permettant de mettre ce travail en perspective dans le contexte de la thèse.

ARTICLE

International Journal of Clinical Pharmacy

Systematic review of interventions, measured outcomes and the impact of clinical oncology pharmacy activities in the hospital

--Manuscript Draft--

Manuscript Number:	
Full Title:	Systematic review of interventions, measured outcomes and the impact of clinical oncology pharmacy activities in the hospital
Article Type:	Review Article
Keywords:	systematic review; clinical pharmacy; oncology; impact.
Corresponding Author:	Anthony SOURISSEAU, Interne CHU Nantes: Centre Hospitalier Universitaire de Nantes Nantes, FRANCE
Corresponding Author Secondary Information:	
Corresponding Author's Institution:	CHU Nantes: Centre Hospitalier Universitaire de Nantes
Corresponding Author's Secondary Institution:	
First Author:	Anthony SOURISSEAU, Resident
First Author Secondary Information:	
Order of Authors:	Anthony SOURISSEAU, Resident
	Clémentine FRONTEAU, Pharmacist
	Jean-François HUON, Pharmacist
Order of Authors Secondary Information:	
Funding Information:	
Abstract:	Objective: Clinical pharmacy is a growing discipline. It is practiced in many ways and numerous impact assessments have been published. The outcomes are therefore very diverse. Oncology is an area that has been the subject of considerable research. The objective was therefore to take a look at clinical pharmacy research activities in oncology in order to provide a better understanding of this practice and to evaluate its methodology. Method: This literature review was based on PRISMA criteria and registered in the international PROSPERO database (number CRD420222604). The Embase, Cinahl, Google Scholar and PsycInfo databases were consulted. The quality of randomized studies was evaluated using the CONSORT tool. Results: The initial query returned 2,521 results, of which 93 were selected for a full review. The main interventions implemented were pharmaceutical analysis and pharmaceutical interviews. The most frequently assessed indicators were the number of pharmaceutical interventions and treatment-related problems. Conclusion: Clinical pharmacy activity in oncology still lacks robust studies, either methodologically or on the indicator measured. Patient-centered impact indicators are still too rare. This field of research should focus on the homogenization of indicators as well as their relevance.

Systematic review of interventions, measured outcomes and the impact of clinical oncology pharmacy activities in the hospital

Authors : Anthony Sourisseau[1], Clémentine Fronteau[1], Jean-François Huon[1, 2]

[1] Hospital pharmacy, CHU de Nantes, France

[2] Inserm UMR 1246 SPHERE: methods in patient-centered outcomes and health research, Nantes, France

Anthony Sourisseau : anthony.sourisseau@gmail.com

Acknowledgements :

The authors would like to thank Catherine Weill, in charge of research unit at the University of Paris-Descartes, and Nathalie Dremeau, trainer and pedagogical advisor at the University Library of Nantes.

Abstract

Systematic review of interventions, measured outcomes and the impact of clinical oncology pharmacy activities in the hospital

Objective: Clinical pharmacy is a growing discipline. It is practiced in many ways and numerous impact assessments have been published. The outcomes are therefore very diverse. Oncology is an area that has been the subject of considerable research. The objective was therefore to take a look at clinical pharmacy research activities in oncology in order to provide a better understanding of this practice and to evaluate its methodology.

Method: This literature review was based on PRISMA criteria and registered in the international PROSPERO database (number CRD420222604). The Embase, Cinahl, Google Scholar and PsycInfo databases were consulted. The quality of randomized studies was evaluated using the CONSORT tool.

Results: The initial query returned 2,521 results, of which 93 were selected for a full review. The main interventions implemented were pharmaceutical analysis and pharmaceutical interviews. The most frequently assessed indicators were the number of pharmaceutical interventions and treatment-related problems.

Conclusion: Clinical pharmacy activity in oncology still lacks robust studies, either methodologically or on the indicator measured. Patient-centered impact indicators are still too rare. This field of research should focus on the homogenization of indicators as well as their relevance.

Key words: systematic review, clinical pharmacy, oncology, impact.

Impact of findings on practice:

Homogenization of research in this area. More patient-centered studies and health outcomes.

Introduction:

The profession of clinical pharmacist is a constantly evolving discipline. The term was first used in the 1960s in the United States and first defined in 1961 by Charles Walton as "the optimal use of the pharmacist's pharmaceutical and biomedical judgment and knowledge to improve the effectiveness, safety, economy and accuracy with which drugs are to be used in the treatment of patients". [1].

This definition reflects the ability of this mode of practice to be applied in many ways, and the approach to clinical pharmacy is different in each country. Some pharmacists have the ability to modify dosages or prescribe certain treatments under interprofessional agreements, whereas other countries still limit this activity to pharmaceutical analysis of prescriptions.
Research in this area is recent, and more and more impact assessments of clinical pharmacy activities are being published. Nevertheless, the indicators used are not always robust, so it is necessary to synthesize the outcomes reported in the articles to try to assess their relevance.
Oncology is a discipline in which many studies have been conducted to date, and for which the interest of a clinical pharmacist is important. To our knowledge, there are no reviews to date that cover all the activities implemented in the context of clinical pharmacy in this field. Therefore, conducting a systematic review of the literature on clinical pharmacy activities implemented in oncology, their impact, and the indicators measured seemed necessary to bring more clarity to this area.

Method:

This is a systematic review of the literature based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) model [2] and carried out according to the protocol registered on the international database PROSPERO [3] (number CRD420222604).

Search Strategy

Five international databases were used in this review. Searches were conducted in collaboration with two experts from the inter-university health libraries of Paris and Nantes.

The Medline database was queried on 09/11/2020 using an appropriate request :

("pharmacists" [MeSH Terms] OR "pharmacist"[Title/Abstract] OR "pharmacy"[Title/Abstract] OR "pharmacy" [MeSH Terms] OR "pharmaceutical services" [MeSH Terms]) AND ("cancer*"[Title/Abstract] OR "oncol*"[Title/Abstract] OR "tumor*"[Title/Abstract] OR "neoplasms " [MeSH Terms] OR "neoplasm*"[Title/Abstract]) AND ("hospital*"[Title/Abstract] OR "hospitals " [MeSH Terms] OR "Pharmacy Service, Hospital " [MeSH Terms])*

Embase, Cinahl, Google Scholar, and PsycInfo databases were consulted on 5/11, 2/12, 8/12, and 9/12/2020, respectively, using an appropriate request for each one. References of selected articles were reviewed to search for studies by snowball effect.

Inclusion and non-inclusion criteria

Studies in which a clinical pharmacist or pharmacy student had conducted an action related to the management of the patient followed in oncology and whose impact could be qualitatively or quantitatively measured were included. Articles written in languages other than English and French were excluded.

Search and Retrieval

Screening of studies was performed by two independent reviewers: Jean-François HUON (JFH) and Anthony SOURISSEAU (AS). The selection was made initially on the basis of the title, then on the abstract and finally after reading of the whole article. For each disagreement during the pooling, the opinion of a third reviewer, Clémentine FRONTEAU (CF), was requested.

The results of the queries were extracted on the reference management software Zotero and then on a shared Excel spreadsheet. Finally, a screening was performed and the main criteria studied were extracted according to the SPIDER method (Sample, Phenomenon of Interest, Design, Evaluation, Research type) [4] : author, location, methodology, population, activities conducted, impact indicators, weakness.

Quality Assessment

A quality assessment of the studies was conducted on the randomized studies using the Consolidated Standards of Reporting Trials tool "CONSORT [5].

Results:

The initial query returned 2,521 results after the removal of 312 duplicates (Figure 1). One hundred and fifty-five articles were chosen for a full review, and 93 of these were ultimately selected for this review. No additional articles were identified by searching the references of the 2,521 articles previously quoted.

Study and Population Characteristics:

Seventy-four percent (n=69) of the included studies were uncontrolled, whereas 26% (n=24) were controlled. The proportions in each of these categories have been detailed (Table 1).

Studies lasted 13 months on average, with a minimum of 1 month [6–8] and a maximum of 6 years and 8 months [9]. Six studies did not specify their chronology [10–15], most of these were surveys or practice reports.

The average interventional population, calculated on nearly 80% of articles (n=75) excluding surveys and practice reports, was 225. Values ranged from 11 [16] to 3000 [17] with 15% of studies having a population of less than 50 people [16,18–30]. The average age of the interventional populations ranged from 35 years [31] to 79 years old [32], when data were available.

Geographical characteristics of the studies:

The United States accounted for 34.4% of the studies ahead of Canada (9.7%), France, and Japan (7.4%, respectively) (Figure 1). Twenty countries were represented in our review.

Different types of intervention:

Table 2 summarizes all areas of pharmacist intervention.

Seventy percent of the studies reported the implementation of a pharmaceutical analysis activity, understood as prescription analysis with verification of dosage, indication, interactions

and associated biology. The most frequently used tools were software such as Drugdex [24,33–35], Safemed [36], Lexi-com [37,38] or Natural Medicines Database [34]. Analysis criteria START (Screening Tool to Alert to Right Treatment) and STOPP (Screening Tool of Older Person's Prescription) [33,38] were also used. Of these articles, seven reported further pharmacy activities as dosage changes or requests for biological tests by the pharmacist under interprofessional agreements [7,12,39–41]. Some pharmacists were in charge of prescribing anti-emetic drugs [14,25], ionic supplementation [14], or treatments to reduce the side effects of chemotherapy [17,39,41].

Almost two out of three studies described the conduct of pharmaceutical interviews. The majority of these interviews [6,11,16,17,21,25,37,39,40,42–55] were aimed at educating patients about their chemotherapy and the identification and management of related adverse events. Accompanying tools such as explanatory booklets [12,29,37,42,44,50,51,54–56,56–59], applications [52,60], tablet [44], antiemetic management schedules [11], or even informations cards [23] had been developed and distributed by some centers during these consultations. Other topics that could be discussed during the interviews included lifestyle modification [58], the management of pain [29,56,59,61], nutrition and psychological approach [43,62] or even phytotherapy [63]. One study extracted the main questions of patients reported in the literature, in order to use them as inspiration for its interviews [64]. Some consultations were multidisciplinary, involving the pharmacist with the physician and/or the nurse [13,20].

An average interview duration of 30 minutes was reported (n=11). The shortest interview duration was 11 minutes on average [46] and the longest of 60 minutes [22]. On average, the time reported was divided by 2 from the second interview onwards. Medication reconciliation was carried out most of the time at the entrance to the hospital [10,28,32,35,38,46,47,52,54,58,64–70], and more rarely at the exit [18,28,31,49,71]. The rest of the studies conducting reconciliation activity did not specify its timing [16,25,26,34,40,51,57,61,72–76]. It could be associated with a sequential intravenous-to-oral therapy organized by the pharmacist [31], the prescription of analgesic support treatments [61],

preparation of the discharge order [26], or the peri-operative management of treatments [67].

Nearly 70% of telephone follow-ups were devoted to the management of post-treatment adverse events [10,11,16,25,26,40,51,56,61,65,77–80]. This method was also used in the assessment and work on patient adherence [40,77,80,81], algaecide management [56], biology monitoring [16] or the reinforcement of the knowledge provided during the preliminary interview [24,63]. 24-hour telephone follow-up via an instant messaging application was offered at one facility during the study period [42]. It was also a way to contact the patient when he or she could not be interviewed directly during the hospitalization [8]

Other types of interventions were reported, including the implementation of Patient Therapeutic Education (PTE) programs [76].

The indicators measured and the results obtained:

Table 3 lists the main indicators measured in the 93 studies submitted for full reading.

The number of pharmaceutical interventions was the most frequently measured indicator. There was a minimum of 0.02 interventions per patient [48] and a maximum of 10.1 [72]. Significance was assessed in 25% of cases, by the Clinical Economic and Organizational (CLEO) tool [49], an adaptation of the method of Leape and al. [82,83], the Hatoum scale [74] or with the help of scales specific to each center [24,28,53,75,84,85].

Problems with treatment were the second most measured indicator with 41% of the studies involved. To qualify this, some centers used the Medication Appropriateness Index (MAI) score [33] or the START AND STOPP criteria [33,38]. The PCNE DRP (Pharmaceutical Care Network Europe Drug Related Problem Classification Tool) was used in 5 studies [35,37,57,85,86]. The NCC MERP (National Coordinating Council for Medication Error Reporting and Prevention) criticality scale was also used [37,82]. Only the study by Ferracini and al. [82] had numerical data and found significant errors in 76% of cases and very significant errors in 22% of cases. Other centers based their criticality analysis on a list of high-risk medications from the Institute for Safe Medication Practices (ISMP) [51,73]. Adverse events were classified using the National Cancer Institute's Common Terminology Criteria

Adverse Events (NCI-CTCAE) [22,37,40,48].

Patient satisfaction was assessed more often (n=15) than that of the health professionals (n=9). It was measured most of the time with the LIKERT-scale [6,11,13,26,28,58,63,75,87] or questionnaires carried out by the centers concerned [6,10,16,24,36,37,50,51,69,71,88]. The CVI (Customer Satisfaction Value Index) was also used in a study [89]. Some articles had compared the satisfaction score in pre-post intervention and the progression of satisfaction was statistically significant in 2 studies [24,75] out of 4 [13,24,75,87].

Evaluation of indicators related to the patient's health status was used in 20% of the studies. Quality of life was measured in 5% of the articles [21,42–44,57], by different scores: QALY (Quality-Adjusted Life Year) [21,42,57], WHOQOL-BREF (World Health Organization Quality Of Life) [43], Eq5D (EuroQol) [21] and EORTC QLQ-C30 (European Organisation for Research and Treatment Of Cancer-Quality of Life Questionnaire) [44]. These scores were significantly increased in 4 of 5 studies [21,42–44]. Other domains related to the patient's health had been assessed, including depression by the Patient Health Questionnaire (PHQ-9) [43,62] or anxiety by the GAD-7 (Generalized Anxiety Disorder) [62]. These scores changed significantly in the intervention group. Pain management was also evaluated in 3 studies, which proved to be statistically significant with a decrease in pain reported following the pharmaceutical intervention [29,56,59] and a study without statistical analyses whose values followed this trend [61]. Progression-free survival was measured in a study [22] and was significantly increased in the interventional group. The readmission rate following pharmaceutical intervention did not vary significantly in 4 articles [24,31,65,87] but was significantly reduced in a study with subgroup analysis [67]. The average length of stay was measured and significantly reduced in one study [31] of three [19,31,67].

All of the studies measuring the economic impact of clinical pharmacy activity in oncology reported a significant benefit. For example, one study that projected avoided costs based on pharmaceutical interventions showed a net benefit of $138,441 per pharmacist per year for total avoided costs of $282,741 [6]. For example, one detected interaction was

estimated to save $317, based on data from another study. One paper found a total benefit of $592,840 for 509 pharmaceutical interventions, but with an estimated benefit of $560 for one drug interaction avoided. [90]. The study by Leary and al. [31] estimated a benefit of $756,478 in 3 months from reduced length of stay due to pharmaceutical interventions.

Patient knowledge was also assessed [11,29,42,50,52,56,59,63,78–80,87] in nearly 13% of articles. Tools such as the BMQ (Beliefs about Medicines Questionnaire) [29,59,78] or the KAP-score (Knowledge, attitude and practices) [42] had been used. The BMQ changed significantly in 100% of the studies [29,59,78], as did the KAP-score [42].

Adherence had also been an indicator assessed [16,22,24,27,29,37,40,44,50,51,57,59,66,72,75,77–79,81,91]. It was estimated by the Morisky score [24,27,57,59,78], significantly improved in 80% of studies after pharmaceutical intervention [24,57,59,78], or by the MPR score (Medication Possession Rate) [22,44,72,77,81,91], with significant progress in 50% of the articles [44,72,91] or by center-specific scores [16,29,37,40,50,51,66,75,79], which varied positively in 44% of cases [16,29,37,66].

Study Quality :

Eight randomized studies [10,42–44,56,57,62,87] could be analyzed (Table 4) using the CONSORT checklist. The average score was 63%, with a range of 38%[10] to 80 % [44].

Discussion:

This review of the literature reflects the fact that research in the field of clinical pharmacy is burgeoning. However, only one in four studies is controlled, and this reflects a real lack of statistical power. The population data also point in that direction. Indeed, most of the studies focus on a small number of patients, which can be explained by the fact that certain activities are time-consuming (interview, reconciliation, etc.), thus reinforcing the statistical difficulties with smaller populations.

The number of pharmaceutical interventions is the main indicator reported in the studies we submitted for full reading. However, the proportion of studies assessing their significance

and acceptance rate is low. This calls into question economic impact assessments that attribute the same cost to minor and major interactions, or the actual clinical impact. Another indicator that was quite present in our review was satisfaction. This is an important parameter, but most of the questionnaires used in the articles are not standardized. In addition, the response bias was on average quite high and therefore this mesure might be unreliable. These types of indicators do not allow us to finely measure the real impact of the presence or action of the clinical pharmacist, and are of only minor interest.

In this work, we have chosen to consider all the actions that can be carried out by the pharmacist in his practice, as well as their measurable impact. The multiplicity of indicators makes comparison between studies more difficult, and moreover, the heterogeneity of the scores evaluating these indicators isn't helping.

Furthermore, although clinical pharmacy is a patient-centred discipline, the proportion of studies using patient health indicators remains low. Indeed, the majority of studies report pharmaceutical analysis, which is the core of the clinical pharmacist's job. However, this remains insufficient if we want to develop this activity as close as possible to the patient.

The subjects addressed by the pharmacist during interviews can be very varied (nutrition, psychology, etc.) and require appropriate training. A survey of institutions revealed that some pharmacists did not feel sufficiently trained to carry out the various missions entrusted to them [92]. This raises the issue of the scope of the clinical pharmacy practice, which must be broad, while being handleable by the latter. If pharmacists become hyperspecialized, they may lose sight of the fact that one of the skills expected of them by other health professionals is their cross-functional vision of patient drug management.

It is interesting to note that a literature search was conducted by Babin and al. [64] to identify the topics that patients would like to discuss during pharmaceutical interviews. This has made it possible to highlight subjects which are not usually discussed in most of the interviews listed in this review (forgetting to take medication, taking alcohol in combination, etc.) and therefore partially calls into question the importance of the information usually

communicated to the patient during the interviews.

Concerning medication reconciliation, the activity at the entrance is predominant. This can be explained by the importance of detecting drug interactions with the chemotherapy that has been started. However, the role of discharge conciliation remains important, particularly in terms of accompanying the patient and his or her adverse effects, and a fundamental city-hospital link when it comes to the patient's pathway.

The limitations of this work include the partial evaluation of the quality of the articles. Indeed, only randomized studies were included. There is also a bias in the selection of studies, as the search was carried out on the most suitable databases, but is therefore not exhaustive. Performing a meta-analysis within the framework of this project is complex due to the heterogeneity of the actions implemented and the impact measurement indicators. Nevertheless, statistical studies will be necessary to conclude on the effectiveness of clinical pharmacy actions implemented in oncology.

Conclusion:

Clinical oncology pharmacy is a rapidly evolving discipline but suffers from a lack of robust and well-constructed studies. Most of the literature is based on an accounting evaluation of activities and still too little on their impact on the patient. The development of research in clinical oncology pharmacy must involve the search for relevant indicators and the desire to go further. Many studies are underway and should move in this direction.

Statements:

Acknowledgements:

The authors would like to thank Catherine Weill, in charge of research unit at the University of Paris-Descartes, and Nathalie Dremeau, trainer and pedagogical advisor at the University Library of Nantes.

Funding:

No financial support was received in the writing of this work.

Conflict of interest:

The authors declare no conflicts of interest in the publication of this article.

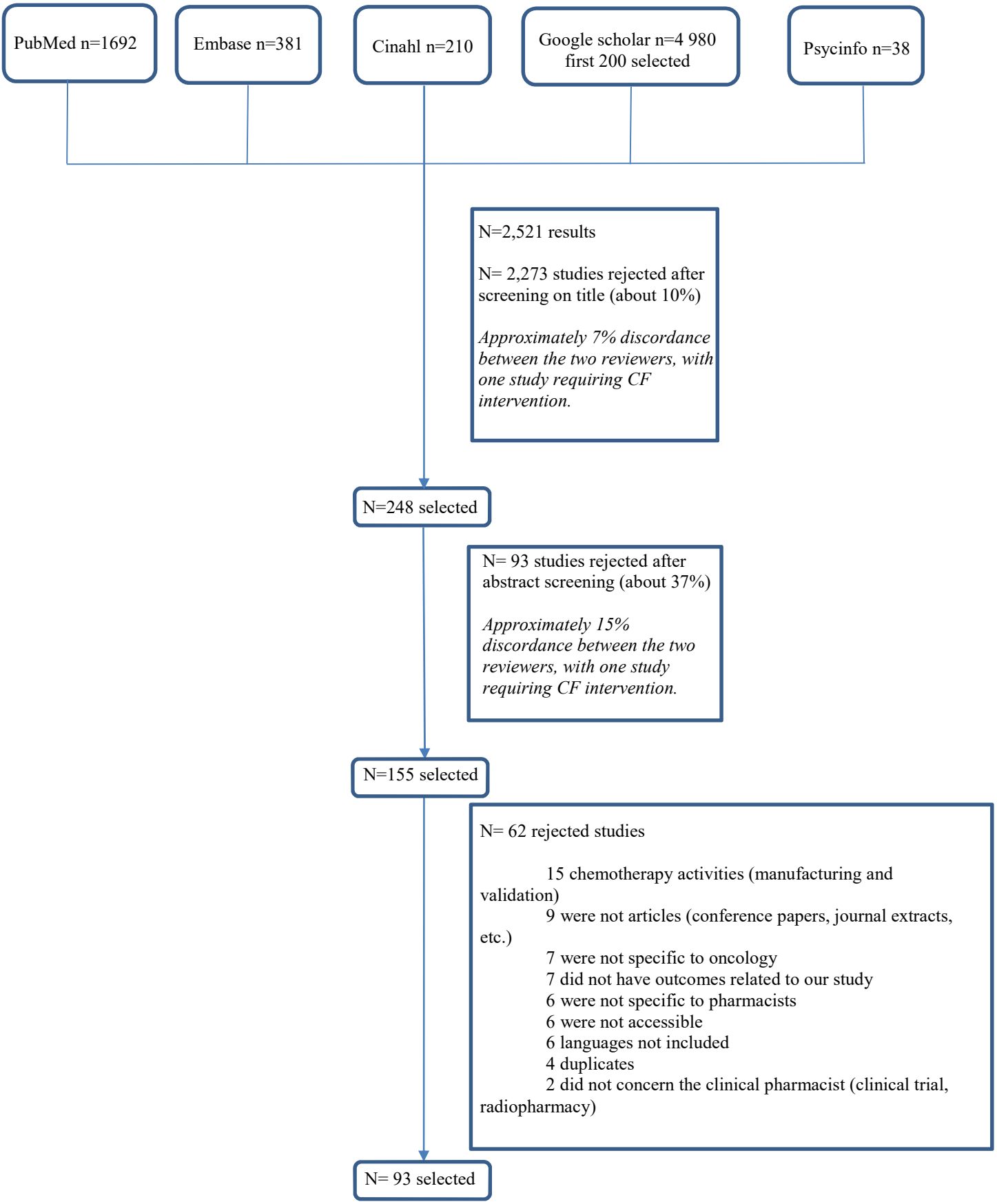

Figure 1. *PRISMA flow diagram*

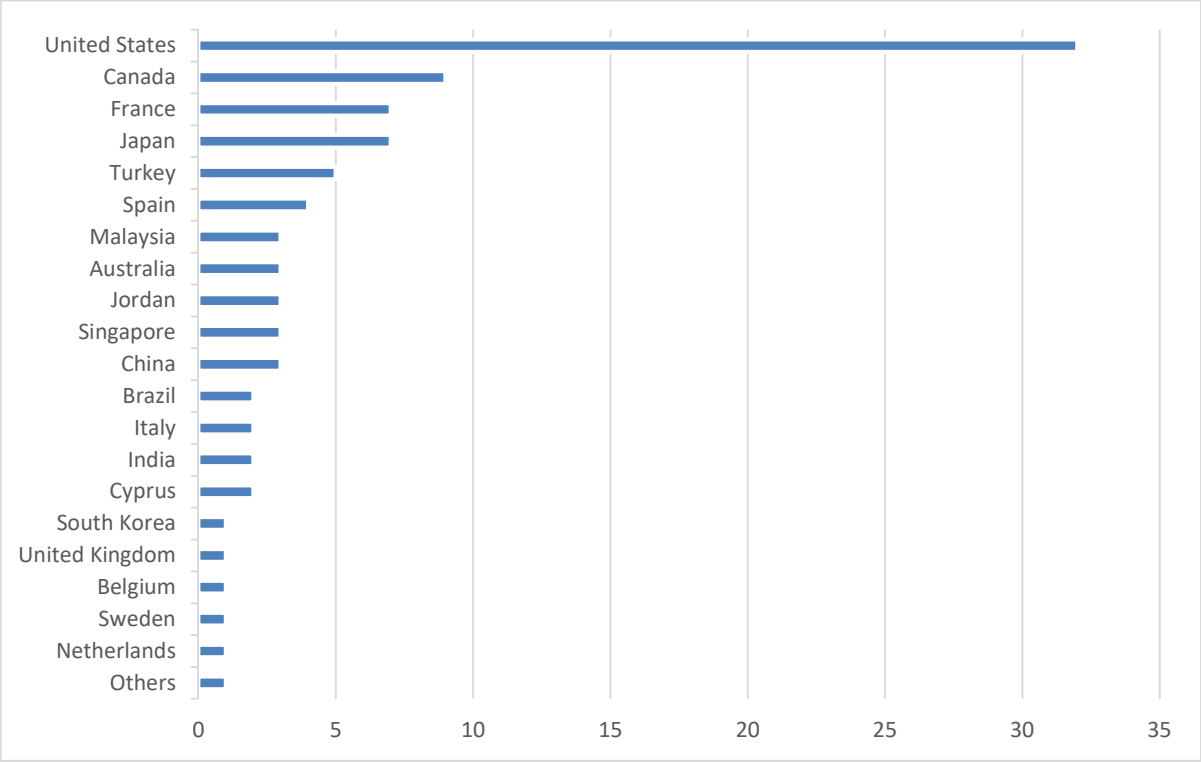

Figure 2. *Distribution of studies by country*

Table 1. *Distribution of controlled and uncontrolled studies*

Uncontrolled studies	**Observational studies**	**Practice reports**	**Surveys**	
69 (74 %)	50 (54 %) [9,11,17,23–29,32–36,38–41,45–52,58–61,64,68,69,71,73–75,78–80,82,84–86,88,90,93–95]	12 (13 %) [6,12–14,53–55,70,89,96–98]	7 (7 %) [7,8,15,76,92,98,99]	
Controlled studies	**Pre-post intervention studies**	**Randomized studies**	**Parallel arms without randomization studies**	**Study with another article as control**
24 (26 %)	**12 (13 %) [16,18–20,31,63,65–67,77,81,91]**	8 (8 %) **[10,42–44,56,57,62,87]**	3 (3 %) **[21,22,37]**	1 (1 %) **[72]**

Table 2. *Main interventions implemented*

	Pharmaceutical analysis	**Patient interviews**	**Conciliation**	**Telephone follow-up**
References	[6,7,9,10,12–17,19,20,22,24–26,30–41,44–49,51–55,57–59,61,64,66,67,69–72,74,75,77,81,82,84,85,90–92,94–98]	[6–8,11–14,16,17,20–29,37,39,40,42–44,46–66,69,72,75,76,78,79,81,87,91,96,99]	[10,16,18,25,26,28,31,32,34,35,38,40,46,47,49,51,52,54,57,58,61,64–76]	[8,10,11,16,24–26,40,42,51,56,61,63,65,72,77–81]
Total	**65 (70 %)**	**59 (63 %)**	**35 (37 %)**	**20 (21 %)**

Table 3. *Main indicators measured in the selected studies*

	Number of pharmaceutical interventions	Number of treatment-related problems	Patient/ staff satisfaction	Patient health status score	Economic impact
References	[6,14–20,23–26,28,30,31,34–36,38,39,41,45,48,49,51,53–55,61,64,71,72,74,75,82,84–86,90,91,94–98]	[10,15,19,21,22,25–28,30,32–38,40,45,46,48,51,54,57,68,72,73,75,82,84–88,93,94,96,98]	[6,10,11,13,16,24,26,28,36,37,50,51,58,63,69,71,75,87,88,93]	[19,21,22,24,27,29,31,42–44,52,56,57,59,61,62,65,67,87]	[6,13,14,16,17,21,31,49,63,71,90,96]
Total	**45 (48 %)**	**38 (41 %)**	**20 (21 %)**	**19 (20 %)**	**12 (13 %)**

Table 4. *Quality assessment of randomized trials using the CONSORT tool:*

References	Study design	Title Abst	Intro	Trial des	Part	Int	Outc	SpSz	Rand seq	Rand alloc	Rand impl	Blind	Stat meth	Part flow	Recr	Bas dat	Num ana	Out est	Anc anal	Harm	Lim	Gen	Intp	Reg	Prot	Fund	n/N%
Wang and Al. 2013[56]	Multicenter randomized controlled trial	1/2	2/2	2/2	2/2	1/1	2/2	1/2	1/2	0/1	0/1	0/2	2/2	1/2	1/2	1/1	1/1	2/2	0/1	0/1	0/1	1/1	1/1	1/1	0/1	0/1	23/37 62%
Edwards and Al. 2014[10]	Randomized controlled study	0/2	1/2	1/2	1/2	1/1	0/2	1/2	1/2	0/1	0/1	0/2	1/2	1/2	0/2	1/1	1/1	0/2	0/1	0/1	1/1	1/1	1/1	0/1	0/1	1/1	14/37 38%
Wang and Al. 2015[42]	Single-center prospective randomized controlled study	1/2	2/2	2/2	1/2	0/1	0/2	0/2	1/2	0/1	0/1	0/2	1/2	2/2	0/2	1/1	1/1	2/2	0/1	0/1	1/1	1/1	1/1	1/1	0/1	1/1	19/37 51%
Periasamy and Al. 2017[43]	Single-blind randomized controlled trial	2/2	2/2	2/2	1/2	1/1	1/2	1/2	1/2	0/1	1/1	1/2	2/2	1/2	1/2	1/1	1/1	2/2	1/1	0/1	1/1	1/1	1/1	1/1	0/1	1/1	27/37 73%
Mohd-Sidik and Al. 2018[62]	Randomized controlled study	2/2	2/2	2/2	1/2	1/1	2/2	1/2	1/2	1/1	1/1	0/2	2/2	2/2	1/2	1/1	1/1	2/2	0/1	0/1	1/1	1/1	1/1	1/1	0/1	1/1	28/37 75%

Salmany and Al. 2018[87]	Randomized controlled study	2/2	2/2	1/2	1/2	1/1	1/2	1/2	1/2	0/1	0/1	1/2	1/2	2/2	1/2	1/1	1/1	2/2	0/1	0/1	1/1	1/1	1/1	0/1	0/1	1/1	23/37 62%
Tan and Al. 2020[44]	Randomized controlled study	2/2	2/2	1/2	1/2	1/1	2/2	1/2	2/2	1/1	1/1	1/2	2/2	2/2	1/2	1/1	1/1	2/2	1/1	0/1	1/1	1/1	1/1	1/1	0/1	1/1	30/37 81%
Al-Taie and Al. 2020[57]	Single-center prospective randomized controlled study	1/2	2/2	1/2	2/2	1/1	2/2	0/2	0/2	0/1	0/1	0/2	2/2	2/2	1/2	1/1	1/1	1/2	1/1	0/1	1/1	1/1	1/1	0/1	0/1	1/1	22/37 60%

DISCUSSION

Cette revue systématique de la littérature a bien mis en évidence que la pharmacie clinique en oncologie se développe, et avec elle les études d'évaluation de sa mise en place. Néanmoins, nous pouvons ajouter que des résultats d'évaluation positifs n'ont qu'une valeur modérée si les indicateurs recherchés ne sont pas pertinents, ou tout du moins peu impactants. C'est hélas le cas dans une grande proportion des études relevées par notre travail.

Le manque d'expérience dans le domaine de la revue de la littérature nous a confronté à plusieurs problématiques. Ce travail m'a d'ailleurs permis de développer une rigueur dans ma recherche ainsi que ma rédaction. La méthode PRISMA est la référence pour les revues de la littérature et demande de travailler dans un cadre bien précis afin de produire une recherche normée et comparable.

Initialement, l'objectif était d'exploiter l'ensemble des bases de données avec la même équation de recherche. Cependant, le nombre de résultats en fonction de la base interrogée variait trop fortement et a demandé de revoir chaque équation en fonction de la source exploitée. Les spécificités de chaque database ont été prises en compte grâce à l'aide de la responsable des services aux chercheurs de l'université de Paris-Descartes.

Pubmed: ("pharmacists"[MeSH Terms] OR "pharmacist*"[Title/Abstract] OR "pharmacy"[Title/Abstract] OR "pharmacy"[MeSH Terms] OR "pharmaceutical services"[MeSH Terms]) AND ("cancer*"[Title/Abstract] OR "oncol*"[Title/Abstract] OR "tumor*"[Title/Abstract] OR "neoplasms"[MeSH Terms] OR "neoplasm*"[Title/Abstract]) AND ("hospital*"[Title/Abstract] OR "hospitals"[MeSH Terms] OR "Pharmacy Service, Hospital "[MeSH Terms])

Embase: 'hospital pharmacy'/exp AND ('oncology'/exp OR 'cancer therapy'/exp OR 'neoplasm'/exp) AND [embase]/lim NOT ([embase]/lim AND [medline]/lim)

Cinahl: (cancer OR oncol* OR tumor* OR neoplasm*) AND (pharmacy service OR hospital

pharmacy)

Goolge scholar: "Hospital pharmacist" AND "Cancer"

Psycinfo: (TI hospital pharmacy OR AB hospital pharmacy OR SU hospital pharmacy) AND (oncology patients or cancer patients or patients with cancer OR cancer therapy OR cancer therapeutics OR neoplasms or oncology or cancer or tumor or malignancy)

Il est également important de définir en amont du travail des critères de recherche en adéquation avec les ressources des chercheurs. En effet, plus les critères seront larges, plus les résultats seront importants, et donc longs à analyser et synthétiser. Il faut également garder en tête que l'ensemble des études sélectionnées doit faire l'objet d'une analyse de qualité et que cela demande beaucoup de ressources. Il a été fait le choix de n'évaluer ici que les études randomisées par manque de temps. Des ressources supplémentaires auraient permis d'être exhaustif sur cette analyse de qualité.

Une autre problématique, inhérente à la revue de la littérature, est le biais cognitif. En effet, elle est forcément soumise au biais d'interprétation des auteurs, qui se doivent d'être aussi impartiaux que possible.

Nous avons pu remarquer un biais de sélection notable, en effet nous avons observé 7 % de discordance à la sélection sur titre et 15 % à la sélection sur résumé qui ont par la suite fait l'objet d'une mise en parallèle et d'une décision commune. Ces choix ont donc pu être soumis à l'influence d'un des deux reviewers.

Il est intéressant de noter qu'un article assez similaire a été publié récemment [100]. Celui-ci se concentrait uniquement sur les patients atteints de cancers hématologiques, et ciblait moins d'outcomes. En effet, les indicateurs étaient restreints aux problèmes liés au traitement, à l'adhésion, à l'éducation et à l'impact économique, mais surtout le travail ne discutait pas le choix de ces indicateurs. C'est en cela que notre étude diffère et peut apporter un autre regard sur la recherche en pharmacie clinique oncologique, en mettant en évidence que lorsque l'on s'intéresse aux indicateurs sélectionnés par les pharmaciens chercheurs, ils peuvent souvent être discutables d'un point de vue impact sur le patient.

CONCLUSION

Cet article avait pour but de faire prendre du recul sur la recherche dans le domaine de la pharmacie clinique oncologique. En effet, il est rassurant de voir que nombre d'acteurs participent au développement constant de cette discipline mais il est également important de prendre en compte les choix méthodologiques qui sont faits par les chercheurs, et le manque de pertinence de nombreux indicateurs. Ce travail ayant mis en évidence le manque de normalisation des indicateurs d'impact et une recherche encore assez faiblement centrée sur le patient, il faut espérer que cette revue systématique permettra d'orienter la recherche en ce sens.

BIBLIOGRAPHIE

[1] Hansel-Esteller S, Castet-Nicolas A. De la recherche clinique à la pharmacie clinique. Pharm. Clin. Thérapeutique, Elsevier; 2018, p. 29-40.e2. https://doi.org/10.1016/B978-2-294-75077-9.00004-9.

[2] Liberati A, Altman DG, Tetzlaff J, Mulrow C, Gøtzsche PC, Ioannidis JPA, et al. The PRISMA statement for reporting systematic reviews and meta-analyses of studies that evaluate healthcare interventions: explanation and elaboration. BMJ 2009;339:b2700. https://doi.org/10.1136/bmj.b2700.

[3] Prospero n.d. https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=222604&VersionID=1495791 (accessed April 29, 2021).

[4] Cooke A, Smith D, Booth A. Beyond PICO: the SPIDER tool for qualitative evidence synthesis. Qual Health Res 2012;22:1435–43. https://doi.org/10.1177/1049732312452938.

[5] Schulz KF, Altman DG, Moher D, for the CONSORT Group. CONSORT 2010 Statement: Updated Guidelines for Reporting Parallel Group Randomised Trials. PLoS Med 2010;7:e1000251. https://doi.org/10.1371/journal.pmed.1000251.

[6] Randolph LA, Walker CK, Nguyen AT, Zachariah SR. Impact of pharmacist interventions on cost avoidance in an ambulatory cancer center. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2018;24:3–8. https://doi.org/10.1177/1078155216671189.

[7] Holle LM, Harris CS, Chan A, Fahrenbruch RJ, Labdi BA, Mohs JE, et al. Pharmacists' roles in oncology pharmacy services: Results of a global survey. J Oncol Pharm Pract 2017;23:185–94. https://doi.org/10.1177/1078155216629827.

[8] Donald G, Scott S, Broadfield L, Harding C, Meade A. Optimizing patient education of oncology medications: A descriptive survey of pharmacist-provided patient education in Canada. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2019;25:295–302. https://doi.org/10.1177/1078155217732400.

[9] Jones KL, Barnett C, Gauthier M, Boster B, Espirito JL, Michaud LB. Clinical outcomes of a pharmacist-managed anticoagulation service for breast cancer patients. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2012;18:122–7. https://doi.org/10.1177/1078155210397775.

[10] Edwards SJ, Abbott R, Edwards J, LeBlanc M, Dranitsaris G, Donnan J, et al. Outcomes assessment of a pharmacist-directed seamless care program in an ambulatory oncology clinic. J Pharm Pract 2014;27:46–52. https://doi.org/10.1177/0897190013504954.

[11] Crespo A, Tyszka M. Evaluating the patient-perceived impact of clinical pharmacy services and proactive follow-up care in an ambulatory chemotherapy unit. J Oncol Pharm Pract 2017;23:243–8. https://doi.org/10.1177/1078155216634180.

[12] Wong RJ, Volberding PA. Providing clinical pharmacy services in an AIDS--oncology ambulatory-care clinic. Am J Hosp Pharm 1988;45:2351–4.

[13] Caselnova DA, Dzierba SH, O'Neill MS, Dillon KR, Farley PC. Implementing clinical pharmacy services in an outpatient oncology clinic. Am J Hosp Pharm 1985;42:1348–52.

[14] Wu HT, Graff LR, Yuen CW. Clinical pharmacy in an inpatient leukemia and bone marrow transplant service. Am J Health-Syst Pharm AJHP Off J Am Soc Health-Syst Pharm 2005;62:744–7. https://doi.org/10.1093/ajhp/62.7.744.

[15] Le Guen R, Madelaine I, Tournamille J-F, Bellanger A, Astier A, Braguer D, et al. [Study impacto: Descriptive analyzis of pharmacist's clinical practice in onco-hematology]. Ann Pharm Fr 2015;73:223–8. https://doi.org/10.1016/j.pharma.2014.10.002.

[16] Conliffe B, Figg L, Moffett P, Lauterwasser L, Parsons LB. Impact of a formal pharmacist-run oral antineoplastic monitoring program: A pilot study in an adult genitourinary oncology clinic. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2019;25:777–86. https://doi.org/10.1177/1078155217753889.

[17] Iihara H, Ishihara M, Matsuura K, Kurahashi S, Takahashi T, Kawaguchi Y, et al. Pharmacists contribute to the improved efficiency of medical practices in the outpatient cancer chemotherapy clinic. J Eval Clin Pract 2012;18:753–60. https://doi.org/10.1111/j.1365-2753.2011.01665.x.

[18] Duffy AP, Bemben NM, Li J, Trovato J. Facilitating Home Hospice Transitions of Care in Oncology: Evaluation of Clinical Pharmacists' Interventions, Hospice Program Satisfaction, and Patient Representation Rates. Am J Hosp Palliat Care 2018;35:1181–7. https://doi.org/10.1177/1049909118765944.

[19] Coutsouvelis J, Corallo CE, Dooley MJ, Foo J, Whitfield A. Implementation of a pharmacist-initiated pharmaceutical handover for oncology and haematology patients being transferred to critical care units. Support Care Cancer Off J Multinatl Assoc Support Care Cancer 2010;18:811–6. https://doi.org/10.1007/s00520-009-0713-4.

[20] Patel JM, Holle LM, Clement JM, Bunz T, Niemann C, Chamberlin KW. Impact of a pharmacist-led oral chemotherapy-monitoring program in patients with metastatic castrate-resistant prostate cancer. J Oncol Pharm Pract 2016;22:777–83. https://doi.org/10.1177/1078155215612541.

[21] Tanaka K, Tachi T, Hori A, Osawa T, Nagaya K, Makino T, et al. Cost utility analysis of pharmacist counseling care for breast cancer chemotherapy outpatients. Pharm 2019;74:439–42. https://doi.org/10.1691/ph.2019.9327.

[22] Zerbit J, Chevret S, Bernard S, Kroemer M, Ablard C, Harel S, et al. Improved time to treatment failure and survival in ibrutinib-treated malignancies with a pharmaceutical care program: an observational cohort study. Ann Hematol 2020;99:1615–25. https://doi.org/10.1007/s00277-020-04045-y.

[23] Renna CE, Dow EN, Bergsbaken JJ, Leal TA. Expansion of pharmacist clinical services to optimize the management of immune checkpoint inhibitor toxicities. J Oncol Pharm Pract 2019;25:954–60. https://doi.org/10.1177/1078155218817937.

[24] Walter C, Mellor JD, Rice C, Kirsa S, Ball D, Duffy M, et al. Impact of a specialist clinical cancer pharmacist at a multidisciplinary lung cancer clinic. Asia Pac J Clin Oncol 2016;12:e367-374. https://doi.org/10.1111/ajco.12267.

[25] Jackson K, Letton C, Maldonado A, Bodiford A, Sion A, Hartwell R, et al. A pilot study to assess the pharmacy impact of implementing a chemotherapy-induced nausea or vomiting collaborative disease therapy management in the outpatient oncology clinics. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2019;25:847–54. https://doi.org/10.1177/1078155218765629.

[26] Ryan N, Chambers C, Ralph C, England D, Cusano F. Evaluation of clinical pharmacists' follow-up service in an oncology pain clinic. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2013;19:151–8. https://doi.org/10.1177/1078155212457805.

[27] Moulin SMM, Eutrópio FJ, Souza J de O, Busato F de O, Olivieri DN, Tadokoro CE. The role of clinical pharmacists in treatment adherence: fast impact in suppression of chronic myeloid leukemia development and symptoms. Support Care Cancer Off J Multinatl Assoc Support Care Cancer 2017;25:951–5. https://doi.org/10.1007/s00520-016-3486-6.

[28] Ho L, Akada K, Messner H, Kuruvilla J, Wright J, Seki JT. Pharmacist's Role in Improving Medication Safety for Patients in an Allogeneic Hematopoietic Cell Transplant Ambulatory Clinic. Can J Hosp Pharm 2013;66:110–7. https://doi.org/10.4212/cjhp.v66i2.1233.

[29] Savas M, Bayraktar-Ekincioglu A, Celebi N. An evaluation of cancer patients' opinions about use of opioid analgesics and the role of clinical pharmacist in patient education in Turkey. Int J Clin Pharm 2021;43:375–82. https://doi.org/10.1007/s11096-020-01098-x.

[30] Reslan Z, Lindsay J, Kerridge I, Gellatly R. Pharmacist review of high-risk haematology outpatients to improve appropriateness of antifungal prophylaxis. Int J Clin Pharm 2020. https://doi.org/10.1007/s11096-020-01090-5.

[31] Leary M-H, Morbitzer K, Walston BJ, Clark S, Kaplan J, Waldron K, et al. Evaluation of Targeted Pharmacist Interventions to Reduce Length of Stay in an Acute Care Practice Model. Ann Pharmacother 2019;53:471–7. https://doi.org/10.1177/1060028018815064.

[32] Couderc A-L, Boisseranc C, Rey D, Nouguerede E, Greillier L, Barlesi F, et al. Medication Reconciliation Associated with Comprehensive Geriatric Assessment in Older Patients with Cancer: ChimioAge Study. Clin Interv Aging 2020;15:1587–98. https://doi.org/10.2147/CIA.S262209.

[33] Gorreja F, Damuzzo V, Gallo U, Russi A, Lo Re F, Ciampalini S, et al. A survey on patients medication reconciliation process in an oncological hospital. Recenti Prog Med 2017;108:141–8. https://doi.org/10.1701/2656.27237.

[34] Ashjian E, Salamin LB, Eschenburg K, Kraft S, Mackler E. Evaluation of outpatient medication reconciliation involving student pharmacists at a comprehensive cancer center. J Am Pharm Assoc JAPhA 2015;55:540–5. https://doi.org/10.1331/JAPhA.2015.14214.

[35] Umar RM, Apikoglu-Rabus S, Yumuk PF. Significance of a clinical pharmacist-led comprehensive medication management program for hospitalized oncology patients. Int J Clin Pharm 2020;42:652–61. https://doi.org/10.1007/s11096-020-00992-8.

[36] Bremberg ER, Hising C, Nylén U, Ehrsson H, Eksborg S. An evaluation of pharmacist contribution to an oncology ward in a Swedish hospital. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2006;12:75–81. https://doi.org/10.1177/1078155206070412.

[37] Ribed A, Romero-Jiménez RM, Escudero-Vilaplana V, Iglesias-Peinado I, Herranz-Alonso A, Codina C, et al. Pharmaceutical care program for onco-hematologic outpatients: safety, efficiency and patient satisfaction. Int J Clin Pharm 2016;38:280–8. https://doi.org/10.1007/s11096-015-0235-8.

[38] Deliens C, Deliens G, Filleul O, Pepersack T, Awada A, Piccart M, et al. Drugs prescribed for patients hospitalized in a geriatric oncology unit: Potentially inappropriate medications and impact of a clinical pharmacist. J Geriatr Oncol 2016;7:463–70. https://doi.org/10.1016/j.jgo.2016.05.001.

[39] Crul M, Oosterhof P. The oncology pharmacist as part of the palliative treatment team. Int J Pharm Pract 2020;28:92–6. https://doi.org/10.1111/ijpp.12583.

[40] Battis B, Clifford L, Huq M, Pejoro E, Mambourg S. The impacts of a pharmacist-managed outpatient clinic and chemotherapy-directed electronic order sets for monitoring oral chemotherapy. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2017;23:582–90. https://doi.org/10.1177/1078155216672314.

[41] Shah S, Dowell J, Greene S. Evaluation of clinical pharmacy services in a hematology/oncology outpatient setting. Ann Pharmacother 2006;40:1527–33. https://doi.org/10.1345/aph.1H162.

[42] Wang Y, Wu H, Xu F. Impact of Clinical Pharmacy Services on KAP and QOL in Cancer Patients: A Single-Center Experience. BioMed Res Int 2015;2015:1–8. https://doi.org/10.1155/2015/502431.

[43] Periasamy U, Mohd Sidik S, Rampal L, Fadhilah SI, Akhtari-Zavare M, Mahmud R. Effect of chemotherapy counseling by pharmacists on quality of life and psychological outcomes of oncology patients in Malaysia: a randomized control trial. Health Qual Life Outcomes 2017;15:104. https://doi.org/10.1186/s12955-017-0680-2.

[44] Tan BK, Chua SS, Chen L-C, Chang KM, Balashanker S, Bee PC. Efficacy of a medication management service in improving adherence to tyrosine kinase inhibitors and clinical outcomes of patients with chronic myeloid leukaemia: a randomised controlled trial. Support Care Cancer Off J Multinatl Assoc Support Care Cancer 2020;28:3237–47. https://doi.org/10.1007/s00520-019-05133-0.

[45] Riu-Viladoms G, Carcelero San Martín E, Martín-Conde MT, Creus N. Drug interactions with oral antineoplastic drugs: The role of the pharmacist. Eur J Cancer Care (Engl) 2019;28:e12944. https://doi.org/10.1111/ecc.12944.

[46] Chun DS, Faso A, Muss HB, Sanoff HK, Valgus J, Lund JL. Oncology pharmacist-led medication reconciliation among cancer patients initiating chemotherapy. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2020;26:1156–63. https://doi.org/10.1177/1078155219892066.

[47] Defoe KD, Jupp J, Leslie T. Integration of clinical pharmacists into an ambulatory, pediatric hematology/oncology/transplant clinic. J Oncol Pharm Pract 2019;25:607–12. https://doi.org/10.1177/1078155217752534.

[48] Suzuki H, Suzuki S, Kamata H, Sugama Y, Demachi K, Ikegawa K, et al. Impact of pharmacy collaborating services in an outpatient clinic on improving adverse drug reactions in outpatient cancer chemotherapy. J Oncol Pharm Pract 2019;25:1558–63. https://doi.org/10.1177/1078155218798138.

[49] de Grégori J, Pistre P, Boutet M, Porcher L, Devaux M, Pernot C, et al. Clinical and economic impact of pharmacist interventions in an ambulatory hematology–oncology department. J Oncol Pharm Pract 2020;26:1172–9. https://doi.org/10.1177/1078155220915763.

[50] Bates D, McIntosh D, Chambers CR. An Evaluation of Verbal and Written Methods in Counselling Cancer Patients. Can J Hosp Pharm 1995;48. https://doi.org/10.4212/cjhp.v48i2.2261.

[51] Riu G, Gaba L, Victoria I, Molas G, do Pazo F, Gómez B, et al. Implementation of a pharmaceutical care programme for patients receiving new molecular-targeted agents in a clinical trial unit. Eur J Cancer Care (Engl) 2018;27. https://doi.org/10.1111/ecc.12447.

[52] Park D, Patel S, Yum K, Smith CB, Tsao C-K, Kim S. Impact of Pharmacist-Led Patient Education in an Ambulatory Cancer Center: A Pilot Quality Improvement Project. J Pharm Pract 2020:897190020970770. https://doi.org/10.1177/0897190020970770.

[53] Skledar SJ, Doedyns A, Yourich B. Building an outpatient cancer center pharmacy program across a tristate region. Am J Health-Syst Pharm AJHP Off J Am Soc Health-Syst Pharm 2015;72:126–32. https://doi.org/10.2146/ajhp140233.

[54] Tuffaha HW, Abdelhadi O, Omar SA. Clinical pharmacy services in the outpatient pediatric oncology clinics at a comprehensive cancer center. Int J Clin Pharm 2012;34:27–31. https://doi.org/10.1007/s11096-011-9600-4.

[55] Valgus JM, Faso A, Gregory KM, Jarr S, Savage S, Caiola S, et al. Integration of a clinical pharmacist into the hematology-oncology clinics at an academic medical center. Am J Health-Syst Pharm AJHP Off J Am Soc Health-Syst Pharm 2011;68:613–9. https://doi.org/10.2146/ajhp100414.

[56] Wang Y, Huang H, Zeng Y, Wu J, Wang R, Ren B, et al. Pharmacist-led medication education in cancer pain control: a multicentre randomized controlled study in Guangzhou, China. J Int Med Res 2013;41:1462–72. https://doi.org/10.1177/0300060513491170.

[57] Al-Taie A, Izzettin FV, Sancar M, Köseoğlu A. Impact of clinical pharmacy recommendations and patient counselling program among patients with diabetes and cancer in outpatient oncology setting. Eur J Cancer Care (Engl) 2020;29:1–10. https://doi.org/10.1111/ecc.13261.

[58] McKee M, Frei BL, Garcia A, Fike D, Soefje SA. Impact of clinical pharmacy services on patients in an outpatient chemotherapy academic clinic. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2011;17:387–94. https://doi.org/10.1177/1078155210389217.

[59] Liu J, Wang C, Chen X, Luo J, Xie J, Li S, et al. Evaluation of pharmacist interventions as part of a multidisciplinary cancer pain management team in a Chinese academic medical center. J Am Pharm Assoc JAPhA 2020;60:76–80. https://doi.org/10.1016/j.japh.2019.09.005.

[60] Bowles H, Tawfik B, Abernathy J, Lauer R, Hashemi N, Dayao Z. Pharmacist-Driven Oral Oncolytic Medication Education and Consent. JCO Oncol Pract 2020;16:e1209–15. https://doi.org/10.1200/JOP.19.00418.

[61] Gagnon L, Fairchild A, Pituskin E, Dutka J, Chambers C. Optimizing pain relief in a specialized outpatient palliative radiotherapy clinic: contributions of a clinical pharmacist. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2012;18:76–83. https://doi.org/10.1177/1078155211402104.

[62] Mohd-Sidik S, Akhtari-Zavare M, Periasamy U, Rampal L, Fadhilah SI, Mahmud R. Effectiveness of chemotherapy counselling on self-esteem and psychological affects among cancer patients in Malaysia: Randomized controlled trial. Patient Educ Couns 2018;101:862–71. https://doi.org/10.1016/j.pec.2018.01.004.

[63] Malfair Taylor SC, de Lemos ML, Jang D, Man J, Annable D, Mithani S, et al. Impact on patient satisfaction with a structured counselling approach on natural health products. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2008;14:37–43. https://doi.org/10.1177/1078155207082017.

[64] Babin M, Folliard C, Robert J, Sorrieul J, Kieffer H, Augereau P, et al. [Pharmaceutical consultations in oncology: Implementation, one-year review and outlooks]. Ann Pharm Fr 2019;77:426–34. https://doi.org/10.1016/j.pharma.2019.05.001.

[65] Nguyen PA (Anne), Enwere E, Gautreaux S, Lin H, Tverdek F, Lu M, et al. Impact of a pharmacy-driven transitions-of-care program on postdischarge healthcare utilization at a national comprehensive cancer center. Am J Health Syst Pharm 2018;75:1386–93. https://doi.org/10.2146/ajhp170747.

[66] Sebring EJ, Rudisill MA, Bates JS, Auten JJ, Urick BY, Clark SM. An Evaluation of the Effect of Pharmacist-Led Comprehensive Chemotherapy Consultation Services on Outpatient Appointment Adherence. J Manag Care Spec Pharm 2020;26:723–7. https://doi.org/10.18553/jmcp.2020.26.6.723.

[67] Guisado-Gil AB, Ramírez-Duque N, Barón-Franco B, Sánchez-Hidalgo M, De la Portilla F, Santos-Rubio MD. Impact of a multidisciplinary medication reconciliation program on clinical outcomes: A pre-post intervention study in surgical patients. Res Soc Adm Pharm RSAP 2020. https://doi.org/10.1016/j.sapharm.2020.09.018.

[68] Heffner C, Dillaman M, Hill J. Pharmacist-driven medication reconciliation reduces oral oncolytic medication errors during transitions of care. Am J Health-Syst Pharm AJHP Off J Am Soc Health-Syst Pharm 2020;77:S100–4. https://doi.org/10.1093/ajhp/zxaa168.

[69] Sugama Y, Suzuki S, Kamata H, Suzuki H, Demachi K, Ikegawa K, et al. Evaluation of Clinical Pharmacist Collaborating Service with Oncologist at Outpatient Booth in Cancer Chemotherapy from a Questionnaire Survey. J Basic Clin Pharm 2017;8.

[70] Arnall JR, Petro R, Patel JN, Kennedy L. A clinical pharmacy pilot within a Precision Medicine Program for cancer patients and review of related pharmacist clinical practice. J Oncol Pharm Pract 2019;25:179–86. https://doi.org/10.1177/1078155217738324.

[71] Son H, Kim J, Kim C, Ju J, Lee Y, Rhie SJ. Pharmacist-led interdisciplinary medication reconciliation using comprehensive medication review in gynaecological oncology patients: a prospective study. Eur J Hosp Pharm Sci Pract 2018;25:21–5. https://doi.org/10.1136/ejhpharm-2016-000937.

[72] Lam MSH, Cheung N. Impact of oncology pharmacist-managed oral anticancer therapy in patients with chronic myelogenous leukemia. J Oncol Pharm Pract 2016;22:741–8. https://doi.org/10.1177/1078155215608523.

[73] Phan H, Williams M, McElroy K, Burton B, Fu D, Khandoobhai A. Implementation of a student pharmacist-driven medication history service for ambulatory oncology patients in a large academic medical center. J Oncol Pharm Pract 2019;25:1419–24. https://doi.org/10.1177/1078155219831066.

[74] Faqeer N, Mustafa N, Abd Al-Jalil N, Qur'an T. Impact of clinical pharmacists in an inpatient medical oncology service: A prospective study at a comprehensive cancer center in Jordan. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2020:1078155220943277. https://doi.org/10.1177/1078155220943277.

[75] Yeoh TT, Si P, Chew L. The impact of medication therapy management in older oncology patients. Support Care Cancer 2013;21:1287–93. https://doi.org/10.1007/s00520-012-1661-y.

[76] Occhipinti S, Petit-Jean E, Pinguet F, Beaupin C, Daouphars M, Parent D, et al. [Pharmacist involvement in supporting care in patients receiving oral anticancer therapies: A situation report in French cancer centers]. Bull Cancer (Paris) 2017;104:727–34. https://doi.org/10.1016/j.bulcan.2017.06.012.

[77] Middendorff G, Elsey R, Lounsbery B, Chadwell R. Impact of a specialty pharmacy case management service on adherence in patients receiving oral antineoplastic agents. J Oncol Pharm Pract 2018;24:371–8. https://doi.org/10.1177/1078155217708022.

[78] Birand N, Boşnak AS, Diker Ö, Abdikarim A, Başgut B. The role of the pharmacist in improving medication beliefs and adherence in cancer patients. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2019;25:1916–26. https://doi.org/10.1177/1078155219831377.

[79] Kimura M, Go M, Iwai M, Usami E, Teramachi H, Yoshimura T. Evaluation of the role and usefulness of a pharmacist outpatient service for patients undergoing monotherapy with oral anti-cancer agents. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2017;23:413–21. https://doi.org/10.1177/1078155216655473.

[80] Patel SD, Nguyen PA (Anne), Bachler M, Atkinson B. Implementation of postdischarge follow-up telephone calls at a comprehensive cancer center. Am J Health Syst Pharm 2017:S42–6. https://doi.org/10.2146/ajhp160805.

[81] Morgan KP, Muluneh B, Deal AM, Amerine LB. Impact of an integrated oral chemotherapy program on patient adherence. J Oncol Pharm Pract 2018;24:332–6. https://doi.org/10.1177/1078155217703792.

[82] Ferracini AC, Rodrigues AT, de Barros AA, Derchain SF, Mazzola PG. Prescribing errors intercepted by pharmacist intervention in care of patients hospitalised with breast and gynaecological cancer at a Brazilian teaching hospital. Eur J Cancer Care (Engl) 2018;27. https://doi.org/10.1111/ecc.12767.

[83] Leape LL, Cullen DJ, Clapp MD, Burdick E, Demonaco HJ, Erickson JI, et al. Pharmacist participation on physician rounds and adverse drug events in the intensive care unit. JAMA 1999;282:267–70. https://doi.org/10.1001/jama.282.3.267.

[84] Chan A, Shih V, Chiang J, Chew L, Tay K, Quek R, et al. Clinical pharmacy services and research for lymphoma patients at a cancer center. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2013;19:24–30. https://doi.org/10.1177/1078155212449031.

[85] Kucuk E, Bayraktar-Ekincioglu A, Erman M, Kilickap S. Drug-related problems with targeted/immunotherapies at an oncology outpatient clinic. J Oncol Pharm Pract 2020;26:595–602. https://doi.org/10.1177/1078155219861679.

[86] Boşnak AS, Birand N, Diker Ö, Abdi A, Başgut B. The role of the pharmacist in the multidisciplinary approach to the prevention and resolution of drug-related problems in cancer chemotherapy. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2019;25:1312–20. https://doi.org/10.1177/1078155218786048.

[87] Salmany SS, Ratrout L, Amireh A, Agha R, Nassar N, Mahmoud N, et al. The impact of pharmacist telephone calls after discharge on satisfaction of oncology patients: A randomized controlled study. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2018;24:359–64. https://doi.org/10.1177/1078155217709616.

[88] Cioffi P, Antonelli D, Belfiglio M, Melena S, Petrelli F, Grappasonni I. The impact of a pharmacist as a member of healthcare team on facilitating evidenced-based prescribing of innovative drugs in an Italian oncology department. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2012;18:207–12. https://doi.org/10.1177/1078155211424787.

[89] Patel H, Gurumurthy P. Implementation and evaluation of medicine and therapeutic information service by clinical pharmacists in oncology care setting. J Oncol Pharm Pract 2019;25:60–7. https://doi.org/10.1177/1078155217727141.

[90] Tasaka Y, Yasunaga D, Tanaka M, Tanaka A, Asakawa T, Horio I, et al. Economic and safety benefits of pharmaceutical interventions by community and hospital pharmacists in Japan. Int J Clin Pharm 2016;38:321–9. https://doi.org/10.1007/s11096-015-0245-6.

[91] Curry MA, Chineke I, Redelico T, Terrell C, Bell W, Flood D, et al. Adherence to Oral Anticancer Medications After Implementation of an Ambulatory Adherence Program at a Large Urban Academic Hospital. JCO Oncol Pract 2020;16:e350–6. https://doi.org/10.1200/JOP.19.00167.

[92] Robertson DLN, Babar Z-U-D. Pharmaceutical care of patients with cancer treated on non-cancer wards in the UK: A mixed methods study. Eur J Hosp Pharm 2020;27:143–50. https://doi.org/10.1136/ejhpharm-2018-001662.

[93] Patel H, Gurumurthy P. Improving medication safety in oncology care: impact of clinical pharmacy interventions on optimizing patient safety. Int J Clin Pharm 2019;41:981–92. https://doi.org/10.1007/s11096-019-00860-0.

[94] Delpeuch A, Leveque D, Gourieux B, Herbrecht R. Impact of clinical pharmacy services in a hematology/oncology inpatient setting. Anticancer Res 2015;35:457–60.

[95] Kandemir EA, Bayraktar-Ekincioglu A, Kilickap S. Assessment of adherence to cancer-associated venous thromboembolism guideline and pharmacist's impact on anticoagulant therapy. Support Care Cancer Off J Multinatl Assoc Support Care Cancer 2021;29:1699–709. https://doi.org/10.1007/s00520-020-05669-6.

[96] Waddell JA, Solimando DA, Strickland WR, Smith BD, Wray MK. Pharmacy staff interventions in a medical center hematology-oncology service. J Am Pharm Assoc Wash DC 1996 1998;38:451–6. https://doi.org/10.1016/s1086-5802(16)30346-1.

[97] Davies NM, Spaven JR, Chambers CR. Comprehensive clinical pharmacy documentation in an out-patient cancer facility. Can J Hosp Pharm 1992;45:107–11.

[98] Chew C, Chiang J, Yeoh TT. Impact of outpatient interventions made at an ambulatory cancer centre oncology pharmacy in Singapore. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2015;21:93–101. https://doi.org/10.1177/1078155213519836.

[99] Ise Y, Morita T, Katayama S, Kizawa Y. The activity of palliative care team pharmacists in designated cancer hospitals: a nationwide survey in Japan. J Pain Symptom Manage 2014;47:588–93. https://doi.org/10.1016/j.jpainsymman.2013.05.008.

[100] Oliveira CS, Silva MP, Miranda ÍKSPB, Calumby RT, de Araújo-Calumby RF. Impact of clinical pharmacy in oncology and hematology centers: A systematic review. J Oncol Pharm Pract Off Publ Int Soc Oncol Pharm Pract 2021;27:679–92. https://doi.org/10.1177/1078155220976801.

UNIVERSITÉ DE NANTES **Année de la soutenance 2021**

Nom - Prénoms : SOURISSEAU Anthony, Alexandre, Dominique

Titre de la thèse : Revue systématique des interventions, des outcomes mesurés et de l'impact des activités de pharmacie clinique oncologique à l'hôpital

Résumé de la thèse :

Objectif : La pharmacie clinique est une discipline en développement. Cette activité s'exerce de multiples manières et de nombreuses études d'impacts sont publiées. Les outcomes sont par conséquent très divers. L'oncologie est un domaine qui, quant à lui, a fait l'objet d'une recherche considérable. L'objectif était donc de synthétiser ces données afin d'obtenir une meilleure visibilité.

Méthode : Cette revue de la littérature a été basée sur les critères PRISMA et enregistrée sur la base internationale PROSPERO (numéro CRD42020222604). Les bases de données Embase, Cinahl, Google Scholar et PsycInfo ont été interrogées. La qualité des études randomisées a été évaluée grâce à l'outil CONSORT.

Résultats : La requête initiale retrouvait 2 521 résultats dont 93 ont finalement été sélectionnés pour la relecture complète. Les principales interventions mises en place étaient l'analyse pharmaceutique ainsi que les entretiens pharmaceutiques. Les indicateurs évalués le plus souvent étaient le nombre d'interventions pharmaceutiques ainsi que les problèmes liés au traitement.

Conclusion : Ce domaine de recherche manque encore d'études robustes, que ce soit méthodologiquement ou sur l'indicateur mesuré. Les indicateurs d'impact centrés sur le patient sont encore trop rares. Les études sont nombreuses sur ce sujet et doivent se concentrer sur l'homogénéisation des indicateurs ainsi que leur pertinence.

MOTS CLÉS : REVUE DE LA LITTERATURE, PHARMACIE CLINIQUE, ONCOLOGIE, IMPACT.

JURY

Présidente :	**Madame Sonia Prot-Labarthe,** Professeur des universités - Praticien Hospitalier en Pharmacie clinique, CHU de Nantes
Directeur de thèse :	**Monsieur Jean-François Huon,** Maître de Conférences Universitaire – Praticien Hospitalier en Clinique, CHU de Nantes
Membres du jury :	**Madame Clémentine Fronteau,** Docteur en pharmacie, Praticien Hospitalier, CHU de Nantes **Monsieur Mathieu Boulin,** Professeur des universités - Praticien Hospitalier en Pharmacie Clinique, CHU Dijon Bourgogne **Monsieur Nicolas Serandour,** Docteur en pharmacie, Praticien Hospitalier, CHU de Nantes

---

Adresse de l'auteur : *16 Allée Baco 44 000 Nantes*