

Intermediate care units in progressive patient care model: a systematic literature review

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ABSTRACT

Background: Progressive patient care (PPC) has been defined as a systematic classification and segregation of patients based on their medical and nursing needs. Aim of the present research was to perform a systematic literature review about existing medical intermediate care unit organizational models and their performance strengths and weaknesses with a specific focus on Italian implementation, respect to US model.

Methods: Databases PubMed, Cinahl, Google and Google Scholar were searched until September 2017. The search was limited to Italian and English studies. All study design are included in the review.

Results: Ten studies were included in the review. The American studies showed, after the PPC reorganization, an increase in level of satisfaction and nursing care, a reduction in average length of stay, costs and tensions between nurses and an improvement in nurse-physician communication.

An Italian study reported the results of a project carried out in three case studies (Forli, Foligno and Pontedera hospital), redesigning hospital patient flow logistics around the concept of intensity of care: in all three cases, after the reorganization, an increase in bed occupancy rate (before: 71%, 81%, 65%; after: 78%, 84%, 82%, respectively) and in hospital case-mix complexity (average DRG weight - before: 0.99, 1.07, 1.12; after: 1.19, 1.09, 1.61, respectively) and a reduction in turn-over ratio (before: 2.5, 1.4, 2.8; after: 1.5, 1.2, 1.7, respectively) was recorded. Considering Italian healthcare professionals' point of view, majority of internists supported a hospital remodeling according to PPC model.

Conclusions: The PPC model, theorized in US, has found several applications in Italian regional realities. Improvements in quality of care, appropriateness and productivity in healthcare facilities, that adopted the PPC program, were observed.

Key words: progressive patient care, intermediate care, intensity of care, patient-centered hospital

INTRODUCTION

Progressive patient care (PPC) has been developed in Canada and United States in the 60s. PPC has been defined as a systematic classification and segregation of patients based on their medical and nursing needs. This model focuses on the medical and nursing needs of admitted patient, according to severity of illness [1]. The model may consider five levels of care: intensive care, intermediate care, self-care, long term care and organized home care [2].

A large proportion of hospitalized patients are admitted in the intermediate care [1]. These patients need a moderate amount of nursing care since they are not in critical condition, therefore they can start participating in planning their care; in particular, they can demand therapeutic education [2]. This unit can receive patients transferred from the intensive care even if the majority of patients are admitted to and discharged without any transfer to any section of the hospital [3].

In the Italian reality, hospital organization based on intensity of care is similar to the American PPC model [3,4]. Differently to US example, the Italian model considers only three levels, excluding those that are delivered out of the hospital setting [2]. The adoption of PPC model has been particularly encouraged in Tuscany by the Regional Law no. 40/2005 [5].

We performed a systematic review to describe the existing medical intermediate care unit organizational models and analyze their performance, effectiveness, strengths and weaknesses, with a specific focus on Italian implementation, respect to US model.

METHODS

Identification of relevant studies

This systematic literature review was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement [6].

Databases PubMed, Cinahl, Google and Google Scholar were searched until September 2017.

In the electronic databases (PubMed and Cinahl) the following search terms with boolean operators were used: "progressive patient care", "progressive care", "intensity-of-care", "patient centered hospital", "intensity of care", "patient flow logistics", "patient focused hospital" and "post acute care". In Cinahl the search was limited to the fundamental "Major Heading" (for details see *Supplementary Materials and Methods*).

In addition, grey literature has been screened in Google and Google Scholar using the following algorithms: ospedale per intensità di cure and "ospedale per intensità di cure", respectively (for details see *Supplementary Materials and Methods*).

For Google search, all results that search engine displayed after omitting very similar entries were evaluated.

Furthermore, references of included papers were screened to identify relevant studies not identified by search strategy.

The search was limited to Italian and English studies. No restrictions regarding year of publication were applied. Only published articles with full-text available were included in the review.

Duplicate articles were manually filtered using JabRef 2.10 program.

The study selection was conducted starting with the examination of titles and abstracts of identified articles which was performed independently by three researchers. Successively, the full texts of selected articles have been assessed and the inclusion criteria has been additionally evaluated by each investigator. Disagreement was resolved by consensus.

Eligibility criteria and data collection

All studies that analyzed existing hospital organizational models in medical intermediate care units, performance/effectiveness/efficiency and the strengths and weaknesses of the model were included. Studies evaluated exclusively intensive or post acute care or other level of intensity of care were excluded from the review.

All primary study designs, including existing case reports, were inserted in the review.

Data extraction from the included studies was carried out by three authors independently. From each study following data were extracted: general information, aim of the study, intervention and setting and main results of the study (for details see *Supplementary Materials and Methods*).

RESULTS

Results of the search

Bibliographic research identified 1,493 articles from PubMed, 440 from Cinahl, 61 from Google Scholar and 316 from Google. Seventy-two papers were removed as duplicates. From title and abstract evaluation, 1,944 studies were eliminated. In 294 articles, eligibility criteria were reevaluated and, finally, 10 articles have been included in the review (Figure 1). [4, 7-15].

Characteristics of included studies

The main characteristics of included studies were reported in Table 1. Seven studies were conducted in Italy while the remaining three in the United States.

TABLE 1. Main characteristics of included studies.

GENERAL INFORMATION			INTERVENTION AND SETTING	MAIN RESULTS OF THE STUDY
Author, Year	Journal/ Book/Report	Country		
Abdellah et al. 1959	American Journal of Nursing	United States	<p>At Manchester Memorial Hospital in Manchester PPC program started in April, 1957.</p> <p>A survey among patients was conducted 2 years after the introduction of PPC program.</p>	<ul style="list-style-type: none"> • High level of satisfaction of nursing care, mainly due to the increased intensity of assistance • Greater attachment to nurses of a certain level of care that can make difficult to accept a transfer • A reduction in the turnover of nursing and administrative staff compared to national average
Alesani et al. 2006	Report OASI (Observatory on Italian Healthcare Management)	Italy (LHA Forli)	<p>The hospital consists of 558 beds in 4 different pavilions.</p> <p>The main innovations were:</p> <ul style="list-style-type: none"> • start-up of week surgery; • start-up of post-acute care setting; • the short-stay emergency observation ward • Time analysis from the intervention: 2 years 	<ul style="list-style-type: none"> • Decrease in inpatient admissions and increase of day hospital • Wider case mix • Increase in average DRG weight • Reduction in average length of stay • Greater volume of patients • Creating of a modular healthcare services
		Italy (LHA Foligno)	<p>On February 2006, the hospital is moved in a new building. In the surgery area 5 organizational section are created:</p> <ul style="list-style-type: none"> • operating rooms • day surgery • week surgery • inpatient ward • high care <p>In the medical area the following units are identified:</p> <ul style="list-style-type: none"> • day hospital • inpatient ward • high care <p>A survey was carried out among healthcare workers 3 months after the reorganization of the new hospital.</p>	<p>Weak points come to lights from the interviews:</p> <ul style="list-style-type: none"> • logistics problems • difficulty in switching from a "specialist" to an "intensity of care" logic • difficulty in managing clinical documentation
		Italy (LHA Pisa)	<p>Pontedera Hospital consist of 340 beds in a single building. From April 2003, four functional areas are created: medical, surgery, maternal-infant and emergency area.</p> <p>Time analysis from the intervention: 3 years</p>	<p>In the surgery area:</p> <ul style="list-style-type: none"> • decrease in inpatient admissions • reduction in average length of stay • increase in operating rate (number of surgical hospital admissions undergoing surgical intervention/surgical hospital admissions) • increase in bed occupancy rate • increase in average DRG weight • increase in turnover ratio

TABLE 1 (CONTINUED). Main characteristics of included studies.

GENERAL INFORMATION			INTERVENTION AND SETTING	MAIN RESULTS OF THE STUDY
Author, Year	Journal/ Book/Report	Country		
Bensa et al. 2010	Book "L'ospedale tra presente e futuro"	Italy (Galliera Hospital – Genoa)	Creation of a multidisciplinary unit, called "Ortogeriatria" and establishment of clinical tutor with the identification of three levels: <ul style="list-style-type: none"> • level 1: pre-acute care • level 2: acute care • level 3: post-acute care 	The project aims reducing the average of length of stay in the orthopedic department (in particular patients receiving a fracture to thigh-bone).
Chesi et al. 2012	Italian Journal of Medicine	Italy (Emilia Romagna region)	Thirty-one internists heading operative units in Emilia-Romagna region were interviewed defining the structural, organizational, technological, managerial and staffing characteristics of intensity care of model.	The majority of internists working in the hospitals of Italy's Emilia-Romagna region supported for a hospital remodeling according to PPC model. Almost half (48%) of respondents were agree of a reorganization involving the whole hospital, regardless of beds and size, while 35% favored a departmental organization. The majority (84%) of internists supported the absolute need to identify precise responsibilities among different physicians and medical staff.
De Filippis et al. 2015	"MECOSAN. Management e economia sanitaria."	Italy (Mauriziano Hospital - Turin)	At the end of 2012, a new project was launched at the Mauriziano Hospital in Turin to implement PPC model, which will be completed in all hospital departments in the period 2013-2015.	A project implementing PPC model in the whole hospital with the following aims: <ul style="list-style-type: none"> • improving responses to users; • optimizing times and improving safety of pathways; • improving the management of human resources and skills of health professionals.
De Vries 1970	Hospitals	United States	McPherson Community Health Center was reorganized according to PPC model in 1963. A follow-up study four years after the reorganization was carried out.	Strengths: <ul style="list-style-type: none"> • reduction in the average length of stay at all levels of care • improvement of quality indicators (number of required autopsies, the percentage of transfusions, the number of tonsillectomy and adenectomy) • reduction in costs • reduction in tensions between nurses • improvement in nurse-physician communication
Glorioso et al. 2015	Analisi (Assobiomedica Study Centre)	Italy	Description of the state of the art analyzing the Italian facilities that started, concluded or have intention to start the PPC model. <ul style="list-style-type: none"> • The survey was mainly structured in two sections: the census of Italian healthcare facilities structured according to intensity of care model (web research) • phone interviews to top managers of healthcare facilities identified in the previous phase. 	Out of 576 Italian health facilities 124 declared, in a web search, that concluded, initiated or planned a intensity of care reorganization. Of these, 37 confirmed this experience and agreed to be interviewed by phone. The majority of these structures are located in Emilia Romagna (11 healthcare facilities), Tuscany (10) and Lombardy (9). Most of them started the intensity of care reorganization between 2011 and 2014, only 5 before 2008. In 18 healthcare facilities the reorganization covered some units while in 19 structures affected the whole hospital. Considering the building intervention, in 23 healthcare facilities the existing building has been restricted, in 8 a new building was fabricated and in 3 cases new parts were realized in an existing building. In almost all cases there was a strong resistance to change by medical (in 25 healthcare facilities) and nursing (in 10) staff.

TABLE 1 (CONTINUED). Main characteristics of included studies.

GENERAL INFORMATION			INTERVENTION AND SETTING	MAIN RESULTS OF THE STUDY
Author, Year	Journal/ Book/Report	Country		
Lockward et al. 1960	JAMA	United States	At Manchester Memorial Hospital since April 1957 PPC program started. Time analysis from the intervention: 2 years	<ul style="list-style-type: none"> Decrease in average length of hospital stay (6.4 days versus the national average of 7.6 days in 1957-1958) Increase in nursing care (3.2 hours per patient in 24 hours two years before reorganization and 4.6 hours total per patient in 1958)
Nardi et al. 2012	Italian Journal of Medicine	Italy	A SWOT (Strengths; Weaknesses; Opportunities; Threats) analysis examines advantages and disadvantages to intensity of care organization according to different healthcare professionals.	Weaknesses: <ul style="list-style-type: none"> increase of patients' transfer loss of identity of a unit difficult collaboration between different professionals difficulty of the patient to understand the organization possible uncertainty about responsibilities
Villa et al. 2009	Health Care Management Science	Italy (LHA Forli; LHA Foligno; LHA Pisa)	Analysis of the three cases of hospital (LHA Forli, LHA Foligno, LHA Pisa) redesign recently carried out in the Italian Healthcare System driven by "patient flow logistics" [see Alesani et al.]. Changes are evaluated analyzing performance improvements in: <ul style="list-style-type: none"> quality of care appropriateness productivity 	<ul style="list-style-type: none"> Except for the Foligno hospital case, a reduction in average hospital length of stay Increase in bed occupancy rate Increase in hospital case-mix complexity (average DRG weight) Reduction in turn-over ratio In addition, in the Pontedera (LHA Pisa) and Forli hospitals, an increase in patients' satisfaction was recorded. Finally, in all cases, an increase in patient inflow was documented demonstrating an increased level of attraction.

Considering the years of publication, the first study was published in 1959 and the last one in 2015. In particular, the studies in the United States were carried out around the 60s and 70s [4,7,12], while the studies in Italy were carried since 2006 [8-11,13-15].

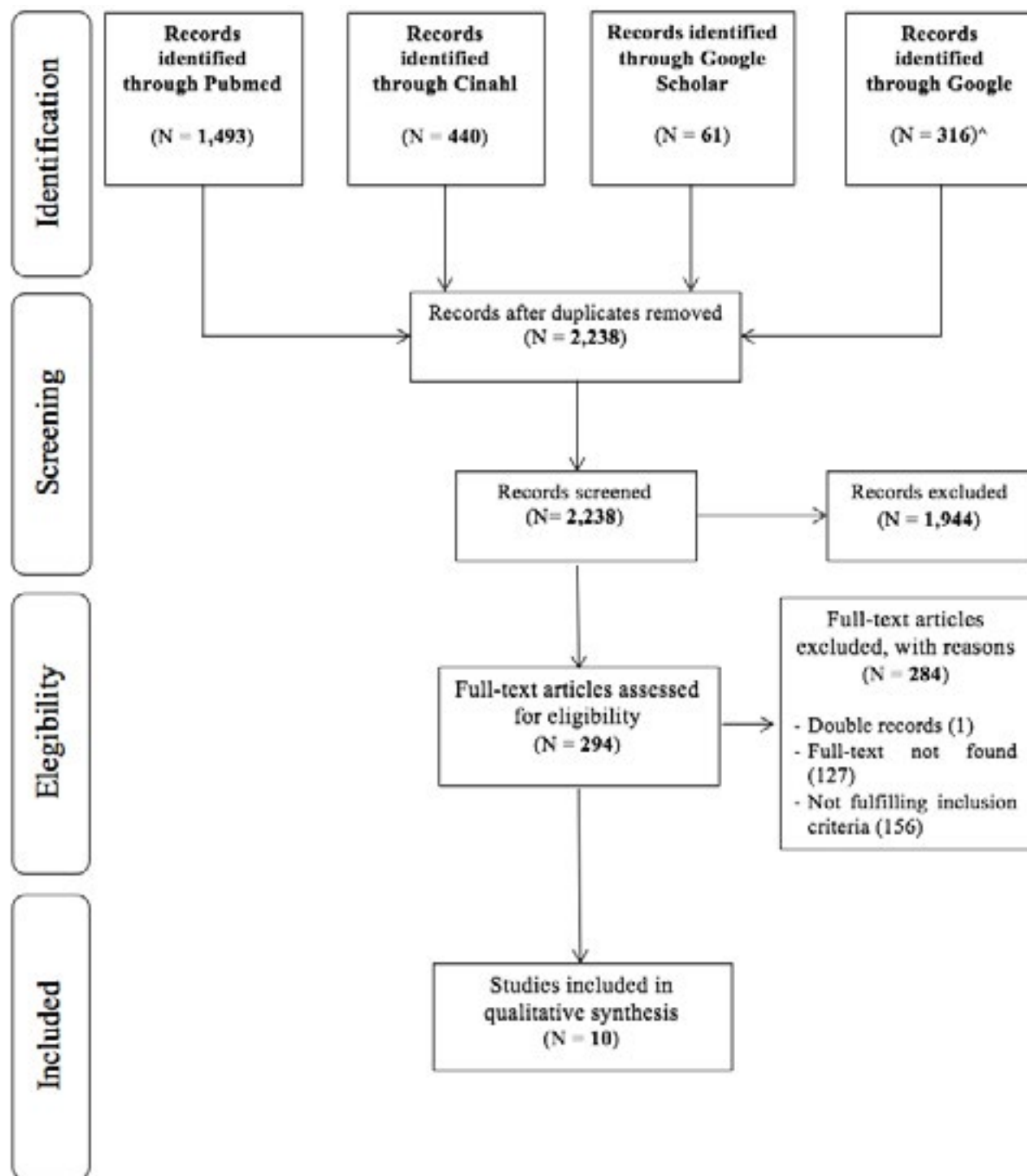
Two American studies evaluated the PPC program at Manchester Memorial Hospital in Manchester, Connecticut, that started in April 1957 [4,7]. In 1959 Abdallah et al. [7] reported the results of a survey about nursing care. The authors highlighted a high level of satisfaction (mainly due to greater assistance intensity), a patient's attachment to nurses that made transfer difficult and a reduction in the turnover of nursing and administrative staff compared to the national average. In addition, a decrease in average length of hospital stay (6.4 days versus the national average of 7.6 days in 1957-1958) and an increase in nursing care (3.2 hours per patient in 24 hours two years before

reorganization and 4.6 hours total per patient in 1958) was observed at the Manchester Memorial Hospital [4].

The third American study, conducted by De Vries et al. [12] in 1970, analyzed the strengths of PPC program at McPherson Community Health Center in Michigan underlining a reduction in the average length of stay at all levels of care, an improvement of quality indicators (number of required autopsies, the percentage of transfusions, the number of tonsillectomy and adenectomy), a reduction in costs, a reduction in tensions between nurses and an improvement in nurse-physician communication four years after the start of the program.

Italian studies were published after the year 2006. In a recent study, Glorioso et al. [13] described the state of the art by analyzing the Italian facilities that had started, concluded or had the intention to start the PPC model. Out of 576 Italian health facilities, 124 declared that they

FIGURE 1. Flow-chart of bibliographic research.



[^]The search engine showed the most relevant results, omitting very similar entries (Total records = 887000).

have concluded, initiated or planned an intensity of care reorganization in a web search. Of these, 37 confirmed this experience and agreed to be interviewed by phone. The majority of these structures are located in Emilia Romagna, Tuscany and Lombardy. Most of them started the PPC reorganization between 2011 and 2014 and

about half of them they only covered some units. In almost all cases a strong resistance to change by medical and nursing staff was recorded.

Alesani et al. [8] and Villa et al. [15] reported the results of a project carried out in three Italian case studies that redesigned hospital patient flow logistics around the

concept of intensity of care: Forlì Hospital, public community hospital with 558 beds included within Forlì Local Health Authority (LHA); Foligno Hospital, public community hospital with 350 beds included within Foligno LHA; Pontedera Hospital, public community hospital with 340 beds included within Pisa LHA. Except for the Foligno hospital case, in the period immediately after the reorganization, a reduction in hospital average length of stay has been observed [Forlì hospital: before 6.0 and after 4.6; Pontedera hospital: before 5.0 and after 4.0]. Furthermore, in all three cases an increase in bed occupancy rate [Foligno hospital: before 81% and after 84%; Forlì hospital: before 71% and after 78%; Pontedera hospital: before 65% and after 82%] and in hospital case-mix complexity [average DRG weight - Foligno hospital: before 1.07 and after 1.09; Forlì hospital: before 0.99 and after 1.19; Pontedera hospital: before 1.12 and after 1.61], and a reduction in turn-over ratio [Foligno hospital: before 1.4 and after 1.2; Forlì hospital: before 2.5 and after 1.5; Pontedera hospital: before 2.8 and after 1.7] were recorded. Finally, patients' satisfaction increased in Forlì and Pontedera hospital.

A recent Italian study [9] reported the project started at Galliera Hospital in Genoa. A multidisciplinary unit, called "Ortogeriatrics", was created that aims reducing the hospital average length of stay in the orthopedic department. Another Italian project of PPC reorganization was started at the Mauriziano Hospital in Turin in October 2012 [11].

The healthcare professionals' point of view about intensity of care was assessed in two studies [10, 14]. Chesi et al. [10] reported the point of view of 31 internists heading operative units in an Italian region (Emilia Romagna). Almost all of the participants expressed their support for PPC model, about half (48%) of respondents were in favour of reorganizing the whole hospital. The majority of respondents underlined the absolute need to identify distinct competencies.

Finally, a SWOT (Strengths; Weaknesses; Opportunities; Threats) analysis examined advantages and disadvantages of PPC organization according to different healthcare professionals. The main weaknesses reported was related to the increased transfer of patients, the loss of identity of a unit, the difficult collaboration between different professionals, the difficulty of the patient to understand the organization and a possible uncertainty about responsibilities.

DISCUSSION

This systematic literature review examined the existing medical intermediate care unit organizational models, analyzed their performance/effectiveness/efficiency, strengths, weaknesses and investigated the implementation in Italy, respect to US model.

Almost all studies included in the systematic review came from grey literature (Google and Google Scholar)

whose research was carried out in Italian. Therefore, the results of this review reported a wide specific focus on Italian reality, according to the aim of the review.

Several studies included in the review examined the strengths and weaknesses of the PPC model from healthcare professionals' point of view [7, 10, 14]. In particular, the majority of internists supported a hospital remodeling according to intensity of care model [10].

The PPC model, adopted in Italy, although theoretically similar to the US example, has found several applications in regional realities but the implementation did not necessarily consider all levels of intensity care [8].

Some specific indicators were used to analyze the PPC model performance: average hospital length of stay, bed occupancy rate, hospital case-mix complexity and turn-over ratio. Improvements in quality of care, appropriateness and productivity were observed [8, 15]. No clinic outcomes were reported. However, the investigation period was short and the significant level of such improvement was not evaluated. Therefore, further studies are necessary to evaluate long-term assessment of the model and consider clinical outcomes.

A recent systematic review explored how hospital organization is changing and how such change may be implemented effectively through managerial tools [16]. The authors identified three main pillars of change: PPC model, the patient-centered approach and the lean approach. In regards to the PPC, the authors found improved efficiency indicators, increased patient satisfaction, more coordination between medical and surgical staff and a better implementation of clinical pathways, which was in line with our results. Furthermore, similarly to the present findings, they did not find evidence related to clinical outcomes.

As reported by Gabutti et al. [16], the efficient allocation of patients is fundamental in the PPC model. Relevant to the patient risk stratification, the application of a tool, such as the National Early Warning Score (NEWS) could be useful to identify the required and most appropriate level of intensity of care and to predict in-hospital serious adverse outcomes [17].

In reference to the limitations of the present study, we focused on a level of intensity of care and on medical hospital organization. Moreover, as reported in Figure 1, we were not able to access several full-texts of selected studies.

In conclusion, the evidence of improvements in quality of care, appropriateness and productivity after a reorganization according to the PPC program can represent an opportunity to offer effective and efficient care for healthcare facilities, in a context of limited resources.

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Conflict of interest statement

No author has any conflict of interest to declare.

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SUPPLEMENTARY MATERIALS AND METHODS

Search strategy

Full electronic search strategy

Electronic databases, such as PubMed and Cinahl, were systematically searched and grey literature was researched in Google and Google Scholar.

PUBMED
String

```
(((((("progressive patient care"[MeSH Terms]) OR
"progressive patient care") OR "progressive care") OR
"intensity of care") OR "patient-centered hospital") OR
"patient flow logistics") OR "patient focused hospital")
NOT "post acute care"
```

Limits: English, Italian
Search date: 2017/10/02

CINAHL
String

```
"progressive patient care" OR "progressive care" OR
"intensity-of-care" OR "patient centered hospital" OR
"intensity of care" OR "patient flow logistics" OR "patient
focused hospital" NOT "post acute care"
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- Limits:
- Language: English, Italian
 - "Major Heading": progressive patient care, patient care, nursing administration, nursing role, nursing care, health facility administration, hospital units, personnel staffing and scheduling, hospitals, quality of health care, nursing staff hospital, nursing care plans, patient admission, staff development, health care costs, health resource utilization, multidisciplinary care team, nursing intensity, outcomes (health care), patient centered care, patient satisfaction, quality improvement.
- Search date: 2017/09/29

GOOGLE SCHOLAR
String

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"ospedale per intensità di cure"
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Advanced search: any language, including patents and quotes

Search date: 2017/10/02

GOOGLE
String

ospedale per intensità di cure

Limits: the most relevant results omitting very similar entries
by the search engine

Search date: 2017/10/03

SUPPLEMENTARY MATERIALS AND METHODS

Data collection

Definitions of extracted data

A data extraction form was developed. From each included study the following information are extracted:

- general information
 - *author*: surname of the first author
 - *year*: year of publication
 - *journal/book/report*: name of journal/book/report in which the study is published
 - *title*: title of the article
 - *country*: country in which the intervention is carried out; if the intervention was realized in Italy the name of Local Health Unit is reported
- aim of the study
- intervention and setting
 - *description of intervention*
 - *context in which intervention was carried out*
 - *time analysis from the intervention*
 - *indicators used to evaluate the intervention*
- main results of the study

