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Internal-surgical co-management in emergency surgery: proposal of an organizational model

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Abstract
The perioperative care of patients undergoing emergency or urgent surgery often involves complex management, especially in elderly individuals with multiple comorbidities. Traditional consultative models, which rely on specialist referrals, may lead to fragmented care. To address this, an integrated model of medical-surgical co-management has been implemented at Careggi University Hospital. This approach emphasizes the involvement of internists in the perioperative management of surgical patients, aiming to enhance continuity of care and improve clinical outcomes.
A cohort study was conducted comparing two groups of patients admitted to the Emergency Surgery Department: one group managed under the traditional model (2016-2019) and one group managed under the integrated model with internist involvement (2021-2024). Key outcomes, including length of stay, transfers to intensive care, mortality, and specialist consultations, were compared between the two cohorts. Data were collected using ICD-9-CM codes, with adjustments made for patient characteristics and procedures.
The cohort managed with internist co-management (n=3427) had a significantly lower mortality rate (2.19%) and fewer transfers to intensive care units (ICU) compared to the cohort managed by surgeons alone (n=3870; 2.94% mortality, 12.3% ICU transfers). The number of specialist consultations for pulmonology, cardiology, and nephrology was also significantly reduced in the co-management group. However, no significant difference was observed in the length of stay between the two groups.
The integration of internists in the management of emergency surgical patients resulted in improved clinical outcomes, including reduced mortality and fewer transfers to high-intensity care settings. While the length of stay did not change significantly, the co-management model appears to offer substantial benefits in optimizing care and resource use. Further prospective studies are needed to confirm these findings and evaluate the economic impact of this organizational model.

Introduction

Patients admitted to surgery are more often elderly and suffering from several diseases, which may worsen during the perioperative phase, requiring the frequent involvement of specialists from various medical disciplines.[1-3] As a result, there has been an increasing need for new organizational models based on the interaction between both surgical and medical specialties.[1-3] At the Careggi University Hospital, this model was implemented in recent years through the gradual integration of medical teams in surgical-oriented inpatient areas, both for orthopedic trauma care and elective surgical settings. This is especially true in elective surgery, but it is even more significant in patients requiring emergency or urgent surgical treatment. Perioperative complications increase in patients with comorbidities and polypharmacy, in whom chronic diseases are often not fully compensated.[1-3] Moreover, in emergencies, the physician does not have time to achieve full equilibrium before the intervention. In such cases, the surgical procedure, compounded by significant pre-existing comorbidities, can be particularly destabilizing and may require continuous, rather than consultative, "internal medicine" support for diagnostic and therapeutic interventions. In emergency surgery, the contribution of medical specialists becomes particularly crucial, as they can enhance the competency system in place for emergency surgical pathways, correcting the instabilities mentioned above and, in the end, improving clinical outcomes and accelerating the healing process.[1] The involvement of internists with experience in the emergency surgical pathway will help reduce reliance on sector-specific specialist consultations, imaging diagnostics, and laboratory tests, making the care process in the Emergency Surgery Department more consistent. In addition to the direct clinical benefits, it is expected that the streamlining of care processes will justify an investment, similar to those described above, for Emergency Surgery as well. Our organizational model aims to promote the concentration of expertise within the Emergency Surgery Department, offering higher quality care by selecting and training staff, while simultaneously improving organizational and care pathways.

Objectives of the proposed organizational model

The overall objective of the project, as outlined in the introduction, is to improve the perioperative management of patients undergoing general emergency and urgent surgical procedures, while reducing the length of stay and implementing streamlined, homogeneous care processes. This includes eliminating time-consuming steps that do not add value.

The introduction of the internist role within the Open Space of Emergency Surgery may enhance patient care regarding existing medical issues or new conditions arising during the perioperative period. This could improve outcomes by reducing morbidity and mortality due to organ and system failures that may occur in the perioperative phase.[1,4]

Specific objectives, aiming to create added value, can be identified as follows:

- ensure continuity of care in the Open Space of Emergency Surgery through a dedicated internist team, providing in-house coverage from 8:00 AM to 8:00 PM, at least six days a week, Monday to Saturday, with on-call availability on public holidays;
- standardize diagnostic, therapeutic, and care protocols;
- optimize the timing of clinical activities;
- optimize bed management to improve overall patient care by early identification of the need for home care pathways or complex discharge processes;
- improve pain management for patients pre- and post-operatively to ensure the highest care standards;
- optimize resources by reducing the need for specialist consultations (e.g., cardiology, infectious disease) and utilizing bedside ultrasound diagnostics, thus accelerating diagnostic and therapeutic processes;
- involve all healthcare providers participating in the surgical patient care pathway in the Open Space of Emergency Surgery;
- facilitate the system of relations with the Medical Specialties and Emergency Department units, Intensive Care Units, and the Agency for Out-of-Hospital Continuity of Care;

- establish a single point of reference in the ward for patients and authorized caregivers/family members to receive updates on the patient's condition.

In Table 1, we present the proposed co-management activities involving various healthcare professionals within the Emergency Surgery Department, along with the times these activities are carried out and the professionals involved.

The patient, during their entire stay in the Open Space, remains formally under the care of the Emergency Surgery Unit, which is responsible for discharge. The internist is responsible for preparing a final internist evaluation, which includes progress notes related to the medical issues that arose during the hospitalization, any recommendations, and medical therapy to be followed at home.

In the course of their integrated activity, the internist directly and actively accesses the electronic medical record and the surgical log of patients hospitalized in the Emergency Surgery Unit, registers their evaluations in the medical diary, modifies the therapeutic chart, and requests laboratory tests, consultations, and/or instrumental investigations for managing internist-related issues.

During the surgical hospitalization, the internist may evaluate the patient and propose their transfer to an internist ward or a sub-intensive care setting to ensure the best quality of care and nursing for complex or critically ill patients. The final decision will, however, be collegial and made in agreement with the colleagues from the Emergency Surgery Unit and Intensive and Sub-intensive Care Units.

Between 8:00 AM and 2:30 PM, the internist actively oversees the Open Space ward. From 2:30 PM to 8:00 PM, the internist performs re-evaluations of critically ill patients and addresses issues that emerged during the morning visit, and conducts further evaluations as needed on call.

Anesthesia services for the Emergency Surgery ward are provided by the "Intensive Care and Severe Organ Failure" Unit, and these will be delivered through three different modalities: i) follow-up care for the immediate postoperative period; ii) consultative activity for procedural interventions; iii) management of emergency services through telephone contact.

Regarding the management of the first 24-48 hours post-surgery, with the approval of this project, a working group will be established to develop specific management protocols in collaboration with the Emergency Surgery Unit and the Intensive Care and Severe Organ Failure Unit colleagues, particularly addressing: i) handover procedures; ii) anticoagulant therapy; iii) pain management therapy; iv) antibiotic prophylaxis; v) any issues closely related to the immediate postoperative period.

Materials and Methods

Study design

The proposed organizational model has been implemented since 2021 at the Careggi University Hospital. A total of six physicians specialized in Internal Medicine have been involved, with a stable role in internist co-management in the Emergency Surgery department. We evaluated the co-management organizational model in terms of reduction in length of stay, reduction in the number of specialist consultations requested from internal medicine departments and number of transfers to intensive/sub-intensive care We also compared the cohort of patients admitted during the implementation of this organizational model (from January 1, 2021, to January 1, 2024) with the cohort of patients admitted in the same healthcare setting during a period prior to the new model (from January 1, 2016, to June 30, 2019), excluding the period related to the COVID-19 pandemic, which necessitated urgent and significant changes in hospital pathways. ICD-9-CM coding was analysed to stratify patients by type of surgical intervention. Data collected included vital status at discharge, length of stay, any transfers to subintensive/intensive care units or internal medicine wards, and the specialist internal medicine consultations. Specifically, we focused on the pulmonology, cardiology, and nephrology consultations requested during the two periods.

Results

From January 1, 2021, to January 1, 2024, a total of 3427 patients were admitted to the Emergency Surgery department, while from January 1, 2016, to June 30, 2019, 3870 patients were admitted. The

average age of the two cohorts was essentially similar. The general characteristics, performed procedures, and the number of specialist consultations requested during the two periods under review are summarized in Table 2.
Table 3 presents the main outcomes used to evaluate the effectiveness of the proposed organizational model.

Discussion

The analysis of our organizational model of co-management highlights the potential usefulness of collaboration between internists and surgeons toward the possibilities of the hospitalist role.[1-3] Our co-management model aims to overcome the old consultative model, which inevitably leads to fragmentation of care and relationships with the patient and caregivers/family members, and instead implements an effective integration of internist-surgical competencies. In our organizational model, the internist, who takes the role of a hospitalist, is an integral part of the surgical team and conducts daily medical rounds on patients admitted to the emergency surgery ward. This organizational model has proven to be significantly positive in terms of reducing mortality during hospitalization, reducing transfers to high-intensity care settings, and reducing the number of consultations with other internal medicine specialists. However, no significant differences emerged regarding the reduction of length of stay. The hospitalist is a medical role already widespread in many European countries, and its importance is also increasing in Italy. The American College of Physicians defines an "internist" as a specialist who possesses the skills to manage complex cases, such as patients with multiple comorbidities, polypharmacy, coordinate multiple health issues, and collaborate with other specialized healthcare professionals.[5] A hospitalist is an internist who has the skill to take on the care of a complex patient through a care model centered on the patient, preventing fragmentation of care.[1,6] Furthermore, the hospitalist manages the entire hospitalization process from admission to discharge, addressing any discharge difficulties and interacting with local healthcare facilities.[1-3] In European and American hospitals, the hospitalist role is already defined and considered a high-level specialist position regarding care quality, patient safety, optimization of palliative care, and home care pathways.[1-3,5,7] Hospital medicine is continually evolving, with a specific goal of increasing the value and quality of care. While consultative medicine aims to answer specific clinical questions with a partial view, co-management models aim to avoid fragmentation of care, particularly in the management of complex patients.[8] The varying outcomes achieved by co-management models are likely related to the variability in how these models are structured.[9,10] An analysis of 694,806 surgical hospital admissions by Sharma *et al*. found a significant annual increase of 11.4% in co-management by generalists, from 33.3% in 1996 to 40.8% in 2006 ($p<0.01$).[11] Chen *et al*. examined Medicare patients, identifying variability in medical visits for those undergoing colectomy (interquartile range (IQR) 50-91%) and total hip replacement (IQR 36-90%), with a significantly higher visit rate for patients with postoperative complications (IQR 90-95%).[12] However, in many countries, such as Italy, there remains some skepticism among surgeons about the holistic approach of internists.[1,2] In an article published in 2008 in the *Journal of Hospital Medicine*,[13] the authors begin with the sentence: "Just because you can, doesn't mean you should". The study highlights the pros and cons of physician-surgeon collaboration and the significant impact on job satisfaction for both internists and surgeons, who, thanks to this organizational model, have more time to dedicate to surgical activities. Co-management models should be developed thoughtfully and systematically, with careful consideration of both expected and unexpected consequences.[13] An extremely large observational study that analyzed over 70,000 surgical admissions at the highest-volume hospital in southern Brazil demonstrated that high-risk patients, defined by comorbidities, type of surgery, and polypharmacy, could benefit from medical-surgical co-management.[14] Depending on the subgroup analyzed, mortality reduction ranged from 10% to 13%, and the reduction in 30-day hospital readmission rates ranged from 37% to 46%. However, a longer hospital length of stay was associated with patients receiving medical consultations, as well as increased mortality in low-risk surgical patients.[14] Regarding mortality, there is considerable variability in the literature, which likely depends on the

surgical setting and type of surgical pathology. Mortality benefits have been consistently demonstrated in various groups of surgical patients, including cardiothoracic [8.1-2.5% (p=0.01)], vascular [1.56-0.0008% (p=0.003)], and others.[12,15] In one of the earliest studies on this topic, Fisher *et al.* found a significant reduction in mortality from 7.7% to 4.7% (p<0.01) in patients aged 60 years and older admitted for hip fractures.[15] Moreover, patients with more complex conditions and greater disease severity tend to experience the most significant benefits from co-management.[13,16] The analysis of the literature,8,[12-22] and the results of the FADOI-ER ER survey,[6] conducted in 2006 by the Federation of Hospital Internal Medicine Directors to characterize Italian co-management models, suggest that the internist, with their cross-disciplinary expertise, holistic vision, and widespread presence even in smaller hospitals, can take the role of hospitalist in medical-surgical co-management models. These models need to be designed and adapted based on the characteristics and needs of each hospital. Other data emerging, particularly in Italy, indicate that implementing such organizational models requires adequate resources in terms of medical personnel, particularly specialists in internal medicine.[6,23,24] For organizational models similar to ours to function effectively, more time needs to be dedicated to delivering these services, which would require redistributing resources. From an organizational perspective, it might be useful to identify surgical patients who require daily internist evaluation, using shared engagement criteria and specific settings based on partially recognized risk factors.[25,26] Regarding the strengths of our study, it is important to note that, to the best of our knowledge, it is one of the largest studies on medical-surgical co-management in Italy. This study undoubtedly has several limitations: it is retrospective, lacks certain clinical data, and is monocentric. Recording bias is another factor to consider, as electronic medical records were the data source. Despite similar lengths of stay, the internist's contribution can help to identify and manage pathophysiological aspects not directly related to the primary reason for acute surgical admission. Early recognition of additional internal medicine conditions identified during hospitalization, initiation of clinical management of these conditions, and reporting to the patient's primary care physician in the discharge summary may have beneficial effects on patient health and prevention of further urgent access to healthcare services, which will need to be further investigated.

Conclusions

In summary, medical-surgical co-management is an organizational model that is now well-established in many countries. The results of our study suggest that, in patients, internist-surgeon co-management may have a favorable impact in terms of mortality and the need for transfer to higher-intensity care settings. Targeted prospective studies are needed to analyse the effectiveness and efficiency of this organizational model, which to date appears very promising in terms of both clinical and economic outcomes.

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Table 1. Model of internist co-management activities implemented in the Emergency Surgery department, with working hours and involved professionals.

When	What does it do?	Who does it?
8:00 am 8:30 am	Briefing Bed place evaluation and possible bed manager alert	Surgeon Internist Resuscitator Nurse
10:00 am 12:00 am	Integrated medical visit and reporting of critical patients to the referring resuscitator	Surgeon Internist Nurse
12:00 am 12:30 am	Debriefing and handover	Surgeon Internist Nurse
12:30 am 1:30 pm	Discharge reports and closure of clinical documentation Reassessment of beds and possible bed manager alert	Surgeon Internist
1:30 pm 2:00 pm	News to the family	Surgeon Internist
2:00 pm 2:30 pm	Handover	Surgeon Internist Resuscitator Nurse
2:30 pm 8:00 pm	Re-evaluation of patients with open problems from the morning and re-evaluation on call.	Surgeon Internist Resuscitator
7.30 pm 8 pm	Handover with night guard	Surgeon Resuscitator

Table 2. General characteristics of the two study cohorts.

Parameter	Cohort of patients managed by surgeons (3870)	Cohort of patients managed with internal medicine co-management (3427)
Median age	59.1	58.3
Appendectomy	893 (23.1%)	692 (20.3%)
Cholecystectomy	448 (11.6%)	438 (12.8%)
Colectomy	253(6.5%)	151 (4.4%)
Ileal resection	276 (7.1%)	423 (5.8%)
Gastrectomy	26 (0.7%)	35 (0.5%)
Splenectomy	64 (1.6%)	83 (1.1%)
Other	924 (23.9%)	612 (17.9%)
Endoscopic procedures	891 (23.0%)	1251 (36.5%)
No intervention	95 (2.4%)	108 (3.1%)

Table 3. Outcome in the two study populations.

Parameter	Cohort of patients managed by surgeons (3870)	Cohort of patients managed with internal medicine co-management (3427)	OR (95% CI)	p<0.05
Length of stay (days)	7.87±10.9	7.38±10.5		0.05
Number of transfers to SI/ICU	476	332	0.76 (0.66-0.88)	**<0.05**
Deaths	114	75	0.74 (0.55-0.99)	**0.04**
Number of pneumological consultations	33	18	0.48 (0.27-0.86)	**0.01**
Number of cardiology consultations	206	132	0.71 (0.57-0.89)	**<0.05**
Number of nephrology consultations	45	24	0.6 (0.36-0.99)	**0.04**