

## Mini Review

# Clinical Pathways in High-Risk Surgery: What Makes Them Special and Why do we Need Them?

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## Introduction

Peri-operative management in high-risk surgery is confused by many clinical algorithms, protocols, guidelines and decision rules [1]. In the 1990s Clinical Pathways (CP) were developed to integrate these different nursing and medical protocols in multidisciplinary care plans for low and intermediate risk surgery. Originally they were designed to balance the quality of care and costs, by focusing on better use of resources, a maximum quality of care and minimization of delay in diagnosis and treatment [2,3]. Development and successful implementation of a CP for high-risk surgery may improve the quality of care as well, potentially reducing serious complications, and improving Patient Reported Outcome.

The “European Pathway Association” states, that a CP is a method for patient-care management of a well-defined group of patients during a well-defined period of time. A clinical pathway explicitly states the goals and key elements of care based on Evidence Based Medicine (EBM) guidelines, best practice and patient expectations by facilitating the communication, coordinating roles and sequencing the activities of the multidisciplinary care team, patients and their relatives [2].

Modern high-risk surgery demands a multidisciplinary approach. Surgical specialists are no longer capable nor in charge of the entire clinical process. They depend on various specialities like anaesthesiologists, intensive care specialists and consultants from e.g. endocrinology and nephrology. During the clinical patient journey various departments like the surgical ward, operation theatre, Post Anesthesia Care Unit (PACU) and Intensive Care Unit (ICU) are involved in treating high-risk surgical patients. Until today in most hospitals these units have their own protocols, guidelines and key-performance indicators. Apart from content differences on same topics (e.g. thrombosis prophylaxis) in these monodisciplinary protocols, also large differences in the actual use of and compliance to these protocols are present causing large treatment variation both among medical and nursing staff users.

## Clinical Pathway Development and Implementation Processes

For CP's, essentially three phases can be distinguished: the development, implementation and maintenance (working) phase.

In developing a CP, essentially a multidisciplinary team assimilates different monodisciplinary protocols and guidelines to one overall multidisciplinary CP. By using Plan-Act-Reflect cycles (PAR), an iterative process of informing all users about the protocol and readjusting it takes place in a limited period of time, on all units involved in the clinical process. Analysis of barriers and facilitators at the different units should be part of the development and implementation strategy. Communication between the different units, for alignment of treatment during the clinical stay, is key to a successful development and implementation of a multidisciplinary CP. Whereas the PACU/ICU mandate an hour-to-hour care plan for the initial postoperative period, the post-operative surgical wards need a day-to-day care plan. Hemodynamic, respiratory and adequate pain control criteria are essential during these intra and early post-operative periods. Criteria like hand-over guidelines, early warning scores, pain assessment, feeding and mobilization protocols are essential ingredients, becoming more important when the patient is transferred to the surgical ward.

To complete development and strengthen the compliance process, a variance report overarching both the pre-operative, intra-operative (anesthesia) and all post-operative periods, ideally should be incorporated into the CP. With such variance reports, deviations from the CP are recognised and interventions, necessary to get back on the pathway, are instructed instantly. Variance reports thus enable nurses and young doctors to start treatment without waiting for time consuming approval from the consultant.

During implementation and maintenance phases PAR cycles are essential for dynamic improvement of the CP. Compliance measurements, derived from the variance report are useful tools in PAR cycles for improvement. While working with the CP, and because the pathway is known to the patient and their families, their input by using PROMs can be integrated in the PAR cycle improvement.

## Evidence from Literature

The use of CP's has been discussed in the literature for more than two decades and the definition has become blurred. Pro and con discussions about using CP's are often the result of fear that the use of a CP becomes a business model, or that pathway companies will build CP's and peri-operative care will become the result of a cooking class [3,4].

However, looking in more detail at literature, and although reports are still scarce, the evidence of favourable outcome due to CP's is strong. A number of cluster randomized controlled trials

performed, by the European Pathway Association, e.g. on acute care, COPD and hip fractures, concluded that evidence-based key interventions are better performed after implementation of a CP compared to usual care [5,6]. Furthermore, multimodality strategies like ERAS programmes (enhanced recovery after surgery) nowadays are the core interventions in many CP's for middle and high-risk surgical procedures like colorectal and pancreatic surgery [7,8]. Unfortunately ERAS programmes lack the complete spectrum of all clinical aspects during the entire clinical stay, as well as the multidisciplinary approach. These limitations may be responsible for unclear outcome benefits of ERAS [9].

In the Radboud University Medical Center, we developed and implemented three multidisciplinary CP's in high risk surgical procedures for cardiac, esophagus and pancreatic surgery, which included also the PACU/ICU periods. The development and implementation phases were considered successful after achieving compliances to variance reports of at least 80%.

Evaluation of the clinical outcome of the CP in cardiac surgery patients resulted in more timely and better organized postoperative ICU treatment: improved blood pressure control, a more expedient adequate action to chest tube blood loss and faster weaning from mechanical ventilation [9]. In CP cohorts of esophagus and pancreatic surgery, a reduction in hospital LOS as well as a significant reduction of major complications according to Clavien Dindo was observed [10].

## Conclusion

Although the concept of CP's goes back for more than two decades, a broad implementation has failed so far. However, potential benefits are not limited to cost-effectiveness, the potential of improvement of clinical outcome is tremendous. A successfully implemented CP will improve the quality of care, show a reduction of complications and will be related to a better Patient Reported Outcome and less waste of resources. New designs based on an iterative dynamic process for development and implementation, using variance reports with preset instructions, using barrier and facilitator analyses and PAR cycles, render systems with compliances > 80% and high levels of evidence of improved clinical outcomes. Essentially all care-givers throughout the entire clinical process must be involved and aligned, as is the patient and their family.

## Future Perspective

To bring the development and clinical effectiveness of CP's to

a higher level, new technologies can help in the development and implementation of CP's for the high-risk surgical patient. More complex pathways can be built with the use of continuous monitoring systems on surgical wards, using validated digital wearables. Variance reports have to be built on trend analyses of continuous monitoring data, derived from all units including operation theatre, PACU/ICU and surgical wards. Deviations from the pathway can be recognised sooner, resulting in early interventions to put the patient back on the pathway according to individualized preset goals. In this way CP's will empower nurses, physician assistants and residents in safe treatment decision making. Patients will experience more security during the treatment process and will be empowered by being able to follow their personalized clinical pathway (pCP).

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