Effect of critical pathway for hip fracture: 
a literature review

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Summary

"Effects of critical pathways for hip fracture" was reviewed in 11 articles in 5 developed countries, published from 1993 to 2005. Critical pathway standardizes care and gives patients early ambulation, and reduced complication; consequently, in many cases, it reduces the length of stay (LOS) without degrading patients' outcomes. Critical pathway sometimes increases LOS, if the original LOS was short, so that patients can take as much rehabilitation as needed in order to go home and walk independently. About 23 days is considered to be the possible minimum LOS, as long as the patient has regained ambulatory ability. It would be possible to safely reduce LOS to around 23 days in Japan as well, but it would be necessary to improve rehabilitation programs there, especially early ambulation and early walking exercise without limitation of weight-bearing, in order not to negatively affect outcomes at discharge. It is also necessary to observe the effect on patients' long-term outcomes after discharge, including mortality, readmission, ambulatory ability, and residence especially when LOS is reduced in Japan.

Key words: critical pathway, hip fracture, literature review

Introduction

Hip fracture is one of the primary causes of patients in Japan being bed-ridden, and it necessitates resource-intensive care. The average LOS of patients with hip fracture in Japan was 68.4 days in 2002, which is more than twice as long as in other developed countries, even if those countries include rehabilitation in their LOS. On the other hand, there are many reports that show it is possible to reduce LOS without negatively affecting patients' outcomes at discharge by introducing critical pathway. However, even for the same type of surgery, for example prosthetic hip replacement, rehabilitation schedules, such as first day of ambulatory exercise (3-21 days after surgery) or discharge date (20-40 days after surgery), vary among hospitals, and an agreed-upon critical pathway based on evidence is not established in Japan.

The purpose of this paper is to review literature in developed countries in order to find the evidence of therapeutic effect of critical pathway on hip fracture and determine an ideal LOS, when patients can be discharged with recovering independent ambulation.

Conceptual definition

Critical pathway is a treatment regimen including time-dependent functions used to standardize the care process throughout a treatment course.

Method of literature review

Index formula for (critical pathway) OR (clinical pathway) OR (critical path) OR (clinical path) OR (care map) AND (hip fracture) at CINAHL and PubMed, were used with no limitation in years.
but limited to English or Japanese as of August 2006. Ten articles in CINAHL and 31 articles in PubMed were found, but all articles in CINAHL were overlapped by PubMed. Research papers that analyzed the effect of critical pathway for hip fracture on patients' outcomes by comparison to without critical pathway were selected. Articles that described efforts or process of developing critical pathway, that analyzed effect of critical pathway on other than patients' outcomes, that included other part of fracture, review or comment articles, and other unrelated articles were excluded. No Japanese articles were available in these criteria. Eight articles were selected in this criteria and 3 Japanese articles were added for comparison. Recently LOS is getting shorter in Japan as well, but these Japanese articles were selected because their LOSs are not far from national average LOS in Japan.

Six studies were from medical doctors, 3 were from nurses, one was from physical therapist, and one is unknown. Three studies were from Australia, 2 were from the UK, 2 were from Canada, and 1 was from the United States. Years of publication were from 1993 to 2005.

Results

Design and method
Most studies compared independent patients' outcomes before and after introducing critical pathway prospectively, and some studies adjusted for patients' characteristics (moderators). Ten studies compared outcomes before and after introducing critical pathway in a hospital. One study was a pseudorandomized controlled trial, and one study compared hospitals with critical pathway to hospitals without, in addition to comparing outcomes before and after introducing critical pathway in a hospital. Seven studies were prospective, 3 were retrospective chart review, and one was compared with the data from a retrospective study. Five studies adjusted statistically for moderators between pathway and nonpathway groups, and 3 studies compared in bivariate analyses. Three studies did not consider moderators.

Specific therapeutic processes measured and analyzed
About half of the studies measured therapeutic process (mediators) of critical pathway in addition to final outcomes. Two studies analyzed standardization of care; one study measured waiting time in Accident and Emergency Department, cancellation on the day of the surgery, and time to surgery, one study measured the postoperative days before the patient first got out of bed and walked, and one study measured days to mobilization, which may have led to a good outcome. One study measured initial postoperative rehabilitation and percentage of patients who weight bear as tolerated. The remaining 5 studies discussed mediating processes but did not measure or analyze. Because one study did not result in a desired outcome, its therapeutic process is unclear.

Specific outcomes measured
All studies measured LOS as an outcome, but other outcomes varied across studies. LOS was measured as either a primary or secondary outcome in all studies. Discharge destination was measured in 6 studies. Ambulatory ability (at discharge, 6 months, or 1 year) was measured in 6 studies. Complication (in-hospital or post discharge) was measured in 7 studies. Mortality (in-hospital, 30- and 90-day, within 30 days after discharge, 4-6 months after discharge, or 1 year after discharge) was measured in 5 studies. Readmission rate was measured in 3 studies. Each outcome, revision surgery, cost, date of activities of daily living regained, completion of medical procedure, functional recovery at 3 and 6 months, and permanent nursing home care as a requirement, was measured in a separate study.

The extent to which the intervention produced the desired outcome
Six studies produced desired outcomes, 4 studies produced partly desired outcomes, and one study doubted the effect of critical pathway. Five studies' desired outcomes were: reduced LOS, in-hospital mortality, 1-year mortality, no difference in revision rate, discharge destination, or ambulatory ability; reduced LOS without increasing complications; reduced LOS with reduced 30-day mortality; fewer postoperative complications and more patients returned home within 14 days; reduced LOS with no difference in ambulatory ability on discharge, discharge destination, complication and readmission,
or death rate\(^1\); and early ambulation and early discharge\(^{10}\).

Four studies produced partly desired outcomes. One study got improved ambulation on discharge but longer LOS\(^6\). Kondo et al\(^3\). collected data from three hospitals: one hospital reduced LOS but also reduced the percentage of patients who went home after discharge (some patients went to a nursing home or another hospital), one hospital standardized care, and one hospital reduced LOS but also reduced patients’ ambulatory ability at discharge. One study did not get statistically significant improvements (e.g., reduced LOS and cost), but a trend of improvement could be seen, possibly because of small sample size\(^3\). In one of the studies, although initial postoperative rehabilitation was significantly reduced and patients were significantly more likely to weight bear as tolerated in the pathway group, overall standardized rehabilitation and discharge planning did not affect postoperative function or institutionalization\(^6\).

One study doubted the effect of critical pathway and showed a non-significant decrease of LOS, as well as a non-significant effect on four-month mortality or residential status\(^6\). Authors considered the possible reasons: evidence-based guidelines used in critical pathways are not particularly effective interventions for reducing mortality rate; critical pathways were not adequately followed and there was insufficient statistical power to detect the difference.

**LOS**

There were 3 studies that showed LOS increased by introducing critical pathways although many studies showed they reduce LOS. LOS also depends on whether the hospitals have rehabilitation facilities or not. Roberts et al\(^6\) reported that mean LOS increased from 16.4 to 22.5 days with a significant improvement in ambulation on discharge and a non-significant reduction in admission to institutional care (from 19% to 13%). It was because patients received twice as much occupational therapy. Their critical pathway included hemiarthroplasty and hip screw (types of surgery). Beaupre et al\(^9\) reported that median total LOS (surgical, hospital, and rehabilitation) increased from 21.0 to 23.0 days without significant difference in functional recovery at 3 months and with institutionalization at 6 months. Their critical pathway included both femoral neck and trochanteric fractures. March et al\(^8\) reported that there was a significant increase in the time spent in rehabilitation, from 21 to 26 days for proximal femoral fracture. Ogilvie-Harris et al\(^10\) reported that their critical pathway for hip surgery with rehabilitation schedule brought significantly fewer postoperative complications and greater number of patients returned home within 14 days. However, there are patients who stayed more than for 28 days, and it is unclear what percentage of patients went home within 14 days and average LOS.

The other 4 studies’ critical pathways are mainly for acute care, but include very short rehabilitation terms. Patients may go home, go to rehabilitation facility, sub-acute nursing facility or skilled nursing facility after discharge. Koval et al\(^5\) reported that mean LOS reduced from 21.6 to 13.7 days with no difference in discharge status (place) or recovery of ambulatory ability. Their critical pathway included femoral neck and intracapsular fractures. Gholve et al\(^7\) reported that mean LOS reduced from 19.2 to 15.3 days. Their critical pathway included both intracapsular and extracapsular fracture. Choong et al\(^10\) reported that LOS reduced from 8.0 to 6.6 days, but percentage of patients who went home after discharge also reduced (from 4% to 0%) for fractured neck of femur. About 70% of patients were discharged to rehabilitation facilities. Tallis & Balla\(^12\) reported that the LOS for a fractured neck of femur declined from a mean of 19.3 to 11.0 days without significant reduction of patients who went home (from 12.5% to 10.6%). About 60% of patients were discharged to nursing home or rehabilitation facilities.

In contrast, in Japanese studies, Kondo et al\(^3\) reported that LOS after surgery reduced from 80.0 to 56.8 days for compression hip screw surgery in one hospital and from 59.1 to 47.0 days for prosthetic hip replacement surgery in another hospital. However, some outcomes at discharge also degraded: more patients went institutional (25% to 51%) in the former hospital, and fewer patients could walk at discharge in the latter hospital (91.7% to 66.7%). Shinmen & Tateishi\(^14\) reported that LOS reduced from 61.7 to 51.6 days. There were 4 types of reha-
bilitation protocols dependent on types of surgery (BHP, CCHS, CHS, nail), which were incorporated into the critical pathway. Nagamoto et al. reported that LOS after surgery reduced insignificantly from 71.0 to 67.6 days for prosthetic hip replacement surgery. These last two studies did not report any adverse effect of critical pathway.

Discussion
Critical pathways standardize care and bring patients early ambulation and reduced complication; consequently, in many cases it reduces LOS without negatively affecting patients' outcomes. LOS was the main interest in introducing critical pathways because it is closely related to hospital cost among these countries. Critical pathways generally reduce LOS, but it depends on the original LOS. LOS can be varied among health care systems and hospitals and depends on whether hospitals have rehabilitation facilities or not. Critical pathway may also reduce mortality after hip fracture.

While there are many types of critical pathways for each type of hip surgery or fracture in Japan, in other developed countries critical pathway is not usually for a specific type of fracture or surgery. It is encouraged for early ambulation without limitation for any types of surgery or fracture. In Japan, there is also a great variation among doctors: while some doctors believe that starting weight-bearing should be later than 3 weeks for CHS and 4 weeks for hip replacement after surgery to prevent complication of the surgery site, some doctors report that starting weight-bearing the next day of a hip replacement didn't cause problems of the surgery site.

It is considered that about 23 days is the minimum LOS, when patients can be discharged to home with regained ambulatory ability after rehabilitation. Percentage of patients who went home or ambulatory ability at discharge were not available in all studies, but it seems that more patients go to institutional care if LOS is shorter than 15–20 days. A study in Japan showed that LOS reduced from 59.2 to 23.5 days and more patients could walk at discharge in patients who started weight-bearing activities the day after surgery of prosthetic hip replacement, resulting in subsequent early rehabilitation. Therefore, it would be possible to reduce LOS to around 23 days safely in Japan as well. However, it would be necessary to improve rehabilitation programs, especially early ambulation and early walking exercise without limitation of weight-bearing, in order not to degrade outcomes at discharge. It is also necessary to observe the effect on patients' long-term outcomes after discharge, including mortality, readmission, ambulatory ability, and residence especially when LOS is reduced in Japan.

It is necessary to define ideal LOS to be what percentage of patients can go home with regained which level of ambulatory ability, but not all article clearly stated about it. Definition of LOS (e.g. acute care and/or rehabilitation) in each article was also unclear. In this paper, it was focused about the effect of critical pathway, and the articles that were available were not enough to discuss LOS. It is necessary to further research to decide ideal LOS, but this paper could be a preliminary report.

Conclusion
Critical pathway is an evidence-based care guideline and coordinated multidisciplinary approach that standardizes care and brings patients early ambulation and reduced complication; consequently, in many cases, it reduces LOS without negatively affecting patients' outcomes. Critical pathway sometimes increases LOS, if the original LOS was short, so that patients can take as much rehabilitation as needed in order to go home and walk independently. About 23 days is considered to be the possible minimum LOS, as long as the patient has regained ambulatory ability. However, it would be necessary to improve rehabilitation programs, especially early ambulation and early walking exercise without limitation of weight-bearing, in order not to degrade outcomes at discharge in Japan. It is also necessary to observe the effect on patients' long-term outcomes after discharge, including mortality, readmission, ambulatory ability, and residence. This will be especially important when LOS is reduced in Japan.

References


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