Evaluation of the Implementation of a Multidisciplinary Fast Track Program for Geriatric Acute Hip Fracture Patients at a University Hospital in Resource-Limited Settings

Unchana Sura-amonrattana
Division of Geriatric Medicine, Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University

Theerawoot Tharmviboonsri
Department of Orthopedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University

Aasis Unnanuntana
Department of Orthopedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University

Direk Tantigate
Department of Orthopedic Surgery, Faculty of Medicine Siriraj Hospital, Mahidol University

Varalak Srinonprasert (varalaksi@gmail.com)
Division of Geriatric Medicine, Department of Medicine, Faculty of Medicine Siriraj Hospital, Mahidol University

Research Article

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Abstract

Background: Hip fractures are common among frail, older people and associated with multiple adverse outcomes, including death. Timely and appropriate care by a multidisciplinary team may improve outcomes. Implementing a team to jointly deliver the service in resource-limited settings is challenging, particularly on the effectiveness of patient outcomes.

Methods: A retrospective cohort study to compare outcomes of hip fracture patients aged 65 or older admitted at Siriraj hospital pre- and post-implementation of the Fast-track program. The primary outcome was the incidence of medical complications. The secondary outcomes were time to surgery, factors related to the occurrence of various complications, in-hospital mortality, and mortality at month 3, month 6 and month 12 after the operation.

Results: 302 patients were enrolled from the Siriraj hospital's database between October 2016 and October 2018; 151 patients in each group with a mean age of 80 years were analyzed. Clinical parameters were similar between groups except the Fast-track group comprising more patients with dementia (37.1% VS 23.8%, p<0.012). In the Fast-track group, there was a significantly higher proportion of patients underwent surgery within 72-hours (80.3% VS 44.7%, p<0.001) and the length of stay was significantly shorter (11 days (8-17) VS 13 days (9-18), p=0.017). There was no significant difference in medical complications and mortality. Stratified analysis by dementia status showed a trend in delirium reduction in both demented and non-demented groups, and a pressure injury reduction among patients with dementia after the program was implemented but there was no statistical significance.

Conclusions: The implementation of a multidisciplinary team for hip fracture patients is feasible in resource-limited settings. In the Fast-track system, time to surgery was reduced and the length of stay was shortened. Other outcome benefits were not shown, which may be due to incomplete uptake of all involved disciplines.

Background

Hip fractures are common injuries that result in loss of function, reduction in quality of life, an increase in morbidity and mortality in older people[1, 2]. Globally, more than 4.5 million patients per year suffer from medical complications due to improper management of hip fractures. As society ages, post-hip fracture morbidity may affect up to 21 million persons in 2050[3–6]. Male gender, older age, and multiple comorbidities are associated with an increased risk of death within the first year after a hip fracture[7]. In Thailand, there is an increase in the incidence of hip fractures in people aged 65 years old and older, which substantially increased short term and long term mortality.

Most hip fractures are more likely to occur in frail older people with several geriatric syndromes such as functional impairment, malnutrition and dementia[8, 9]. Consequently, those patients with complex medical comorbidities require more attention prior to undergoing operation. Moreover, they are more likely to be at

risk of postoperative complications and prolonged hospital stays with their pre-morbid complexity. Multiple studies[9–26] have reported that factors such as proper care at presentation, optimal pain control, an orthogeriatric model of care, comprehensive geriatric assessment (CGA), expedited time to surgery and early rehabilitation are associated with a lower risk of complications and decreased mortality in older patients with hip fractures.

After the existing literature with limited evidence from limited resource settings had been reviewed[27–30], a multidisciplinary program titled “Acute Geriatric Hip Fracture: Fast Track in Siriraj Hospital” was initiated for older patients with hip fractures in September 2017. Although the primary target was to reduce the time to surgery, the ultimate goal was to improve patients’ outcomes. The purpose of this study was to evaluate patient outcomes before and after implementation of the Fast Track for the Acute Hip Fracture program. The primary outcome was the incidence of medical complications. The secondary outcomes were time to surgery, causes of delayed surgery, short-term and long-term morbidity and mortality.

Methods

Study Design and Data Collection

All patients with hip fractures admitted to the Department of Orthopedics, Siriraj Hospital, Thailand, from October 2016 to October 2018 were identified retrospectively from the Siriraj hospital’s database and the Orthopedic department’s database. The hip fracture patients aged 65 years or older admitted and had a complete medical record were selected to be the subjects for the study. Patients who underwent elective surgery were excluded, and then the included population were divided into the PRE-fast track group and the Fast-track one according to the time of the program implementation.

Medical records were retrieved according to the ICD-9,10 (International Classification of Diseases 9-10th Revision) diagnostic codes for hip fracture (820.0-820.9 and S720-S722). Among 905 medical records identified, 803 were patients aged ≥ 65 years (Fig. 1). After having initially reviewed, medical records were sorted, according to admission number (AN) for both the PRE-fast track group and the Fast-track one until the sample size target was met.

All relevant medical records were reviewed to identify patients’ medical comorbidities, premorbid functional status, interventions and complications occurring during hospitalization. With respect to delirium, the detection of delirium was performed by a clinical trainee in geriatric medicine. The patient was determined to have delirium if the medical record contained any documentation representing awareness of the syndrome, progress notes describing delirium or confusion, notes attempting to identify the causes of delirium, or notes describing any treatment to control delirium symptoms. Discharge summaries were reviewed to identify any documentation of the signs and delirium symptoms, as well.

Beginning in July 2016, all hip fracture patients admitted to orthopedic wards were recruited in the Siriraj Fracture Liaison Service (FLS). Patients in the FLS registry were followed from hospital admission until

discharge and subsequent visits. Information regarding mortality and functional outcomes was obtained through electronic hospital records and data from the FLS registry.

PRE-fast track program

The orthopedic trauma team was responsible for the standard hip fracture treatment including pain control, basic preoperative assessment and scheduling surgery time. Surgery would be performed according to the availability of operative rooms and surgeons' regular work schedule. Consultation with the on-call medical teams and the geriatric team was available on request. Physical therapists assessed the patients when they were admitted to the orthopedic ward, but there was no standard protocol on mobilization or postoperative medical management (Table 1).

Siriraj Hip Fracture Fast track program (Fast-track program)

The Fast-track model is a multidisciplinary team of medical specialists and allied health teams including orthopedists, geriatricians, anesthesiologists, physical therapists and nurse coordinators. The Fast-track care commences on admission to the hospital. Acute pain service (APS), operated by anesthesiologists, aims to optimize pain control within the first 24 hours by providing femoral nerve catheter blockade, and then customizing pain medications. Applying the orthogeriatric model of care as a framework, the geriatric team manages the patients within the first 24 hours of admission until the patients were discharged from the hospital. Surgery is scheduled as quickly as possible, and spinal anesthesia is the preferred method. The Fast-track program aims to have all patients in the surgical operating room within 72 hours of admission. The program also aims to prevent medical complications (delirium, urinary tract infection, pressure injury, stroke, pulmonary embolism/deep vein thrombosis, myocardial infarction), provide nutritional counseling and supplements, achieve at least a sitting position on the first postoperative day, and begin discharge planning early in the course of care (Table 1).

Table 1
Comparison of the PRE-fast track program and the Siriraj Hip Fracture Fast track program (Fast-track program).

PRE-fast track program	Fast-track program
- Managed by the orthopedic trauma team - Admitted to the orthopedic wards - Consult on-call medical teams - Geriatric teams available on request - Physical therapists assessed the patients when they were admitted to the orthopedic ward, but no a standard protocol on mobilization	- Reviewed by the orthopedic, geriatric and Acute Pain Service (APS) teams within 24 hours of admission - Admitted to the orthopedic wards - Geriatric team review to optimize medical condition preoperative and monitor during admission - APS operated by anesthesiologists aims to optimize pain control within the first 24 hours by providing femoral nerve catheter blockade - Surgery within 72 hours required after admission - Physical therapists assessed the patient conditions on admission to the orthopedic ward; aimed to achieve at least a sitting position on the first postoperative day

Outcomes

The primary outcome was the incidence of medical complications. The secondary outcomes were the proportion of achieving the 72-hour time-to-surgery target, causes of delayed surgery, hospital mortality, mortality at month 3, month 6, month 12 after the surgery and function status (Barthel index) at post-operative day 4, month 3 and month 12.

Statistical analysis

For the comparison between the patient outcomes of the PRE-fast track program and those of the Fast-track program, a sample size calculation was conducted by assuming the incidence of delirium in the conventional group of 53% and 37% in the intervention group[31]. With 80% power and a 5%, 2-sided level of significance, the estimated sample size was 151 subjects per group.

Baseline characteristics and related factors were analyzed by using descriptive statistics. Categorical variables were analyzed by using Chi-square test. Fisher's exact test was used for categorical data with a count of less than 5. All continuous data were tested for normality. Independent sample t-test and Mann-Whitney U test were used to compare continuous variables, depending on the data distribution. The p-value < 0.05 was considered statistical significance. Statistical analysis was performed by using SPSS for Windows version 18 software.

Results

302 patients were enrolled from the Siriraj hospital's database between October 2016 and October 2018; 151 patients in each group. The mean age of the total population was 80 years, and 43 (28.5%) of subjects were $\geq$ 85 years of age. Gender distribution, comorbidities, and the Charlson Comorbidity Index

(CCI) between both groups were not statistically different. There was a higher proportion of dementia in the Fast-track group (37.1%) compared to the PRE-fast track group (23.8%) ($p = 0.012$). The mean BMI for patients in the PRE-fast track group was 21.9 ± 4.14 and 22.0 ± 3.56 kg/m^2 in the Fast-track group ($p = 0.783$) in Table 2. There was no difference between groups in the hematocrit level, white blood cell count and the serum albumin level. More than 80% of patients had the inadequate vitamin D level in both groups.

Table 2
Baseline characteristics of included population.

	PRE – fast track (n = 151)	Fast-track (n = 151)	p value
Age, years, mean ± SD	80.7 ± 7.51	79.7 ± 7.85	0.272
• ≥ 85 years, n (%)	43 (28.5)	43 (28.5)	1.000
Female, n (%)	107 (70.9)	113 (74.8)	0.438
BMI, kg/m2, mean ± SD	21.89 ± 4.14	22.01 ± 3.56	0.783
• < 18.5	35 (23.2)	23 (15.2)	0.349
• 18.5–22.9	62 (41.1)	76 (50.3)	
• 23.0–24.9	20 (13.2)	21 (13.9)	
• 25.0–29.9	29 (19.2)	28 (18.5)	
• ≥ 30	5 (3.3)	3 (2.0)	
Comorbidities, n (%)	57 (37.7)	52 (34.4)	0.549
• Diabetes mellitus	120 (79.5)	119 (78.8)	0.887
• Hypertension	25 (16.6)	21 (13.9)	0.522
• Ischemic heart disease	4 (2.6)	4 (2.6)	1.000
• Congestive heart failure	34 (22.5)	38 (25.2)	0.589
• Cerebrovascular disease	9 (6.0)	5 (3.3)	0.274
• COPD, Bronchiectasis or Asthma	33 (21.9)	36 (23.8)	0.681
• CKD Stage 3–5	5 (3.3)	6 (4.0)	0.759
• ESRD on HD/CAPD	36 (23.8)	56 (37.1)	0.012
• Dementia			
Charlson Comorbidity Index, mean ± SD	5.55 ± 2.17	5.67 ± 2.34	0.646
Education, years, n (%)	95 (62.9)	89 (58.9)	0.479
• ≤ 4	56 (37.1)	62 (41.1)	
• > 4			

	PRE – fast track (n = 151)	Fast-track (n = 151)	p value
Polypharmacy, n (%)	32 (21.2)	34 (22.5)	0.120
• < 5	64 (42.4)	76 (50.3)	
• 5–10	55 (36.4)	41 (27.2)	
• > 10			
BADL, Dependent, n (%)	21 (13.9)	22 (14.6)	0.869
IADL, Dependent, n (%)	51 (33.8)	59 (39.1)	0.339
Hematocrit, %, mean ± SD	34.71 ± 6.02	34.95 ± 5.52	0.711
WBC count, cell/mm3, mean ± SD	10,059.00 ± 3,306.11	10,525.56 ± 3,686.88	0.249
Serum albumin (pre-op), g/dl, mean ± SD	3.74 ± 0.54	3.76 ± 0.50	0.707
Vitamin D level, ng/mL, mean ± SD (n = 284)	n = 136	n = 148	0.393
• ≥ 30	18.38 ± 9.84	19.36 ± 9.42	0.211
• 20–29*	16 (11.8)	18 (12.2)	
• < 20**	31 (22.8)	47 (31.8)	
	89 (65.4)	83 (56.1)	

BADL = basic activities of daily living

IADL = instrumental activities of daily living

* vitamin D insufficiency 20–29 ng/mL
** vitamin D deficiency < 20 ng/mL

Patients in both groups had similar fracture types including femoral neck fractures and intertrochanteric fractures, which were the majority types. Almost all included patients underwent surgical treatment (93.4% VS 94.0% p = 1.000) (Table 3). After the Siriraj Hip Fracture Fast track program was implemented, 80.3% of patients had surgery within 72 hours compared to 44.7% of those in the PRE-fast track group (p < 0.001). Ninety (63.4%) of the Fast-track group had surgery within 48 hours compared to 39 (27.7%) of those in the PRE-fast track group (p < 0.001) (Table 3).

Table 3
Fracture type, time to surgery and consultation.

	PRE – fast track (n = 151)	Fast-track (n = 151)	p value
Fracture Type, n (%)	74 (49.0)	79 (52.3)	0.725
• Femoral neck fracture	75 (49.7)	69 (45.7)	
• Intertrochanteric fracture	2 (1.3)	3 (2.0)	
• Subtrochanteric fracture			
Pathologic fracture, n (%)	1 (0.7)	1 (0.7)	1.000
Surgery, n (%)	141 (93.4)	142 (94.0)	1.000
Time to surgery†, n (%) (n = 283)	18 (12.8)	45 (31.7)	< 0.001
• ≤ 24 hours	21 (14.9)	45 (31.7)	
• 25–48 hours	24 (17.0)	24 (16.9)	
• 49–72 hours	78 (55.3)	28 (19.7)	
• > 72 hours			
Type of surgery, n (%) (n = 283)	61 (43.3)	61 (43.0)	
• Arthroplasty	78 (55.3)	81 (57.0)	
• Internal fixation	2 (0.7)	0 (0.0)	
• Others			
Ward, n (%)	56 (37.1)	58 (38.4)	0.812
• General ward			
Consult Geriatrics, n (%)	145 (96.0)	151 (100.0)	0.030
Consult within 24 hrs., n (%)	101 (66.9)	139 (92.1)	< 0.001
• Geriatrics	6 (4.0)	47 (31.1)	< 0.001
• Acute pain service (APS)	2 (1.3)	5 (3.3)	0.448
• Physical therapists (PT)			

† Time to surgery = Admission time to operation time

A higher proportion of patients in the Fast-track group obtained the ambulation program on the first postoperative day. The program included the range of motion exercise (ROM) and the ankle pumping. On the 3rd post-operative day, more than 50% of patients were able to stand or walk in the Fast-track group compared to only 31% of the PRE-fast track group in Table 4.

Table 4
Rehabilitation interventions on D1 and D3 after surgery.

		PRE – fast track (n = 141)	Fast-track (n = 142)
Day 1	ROM/Ankle pumping	16 (11.3)	28 (19.7)
	Side sitting	28 (19.9)	37 (26.0)
	Standing	2 (1.4)	4 (2.8)
	Walk	11 (7.8)	18 (12.7)
Day 3	ROM/Ankle pumping	3 (2.1)	6 (4.2)
	Side sitting	16 (11.3)	22 (15.5)
	Standing	5 (3.5)	6 (4.2)
	Walk	39 (27.6)	66 (46.5)

The proportion of participants with delirium at any point postoperatively was similar in both groups. The percentage of delirium in the PRE-fast track group and the Fast-track group were 34.0% and 31.0% respectively (p = 0.583) in Table 5. Other complications were similar in both groups. Importantly, there was a higher proportion of dementia patients in the Fast-track group that may have contributed to clinical outcomes. Therefore, a stratified analysis by dementia status was performed, which revealed a nonsignificant trend toward reduced delirium after implementing the Fast-track program among patients with dementia in Table 6.

Table 5
The primary outcomes.

	PRE – fast track (n = 151)	Fast-track (n = 151)	p value
Post-operative complication, n (%)	n = 141	n = 142	0.583
• Delirium	48 (34.0)	44 (31.0)	0.173
• Urinary tract infection	21 (14.9)	30 (21.1)	0.839
• Pressure injury/ IAD	18 (12.8)	17 (12.0)	0.670
• Pneumonia	10 (7.1)	12 (8.5)	1.000
• Stroke/TIA	1 (0.7)	1 (0.7)	1.000
• Myocardial infarction	1 (0.7)	2 (1.4)	1.000
• Deep vein thrombosis	0 (0.0)	1 (0.7)	1.000
• Pulmonary embolism	0 (0.0)	1 (0.7)	0.561
• Pain score > 4	38 (27.0)	34 (23.9)	0.954
• Anemia (Blood transfusion)	72 (51.1)	73 (51.4)	-
• Wound infection	0 (0.0)	0 (0.0)	
Delirium Type (n = 92), n (%)	36 (75.0)	34 (77.3)	
• Hyperactive delirium	5 (10.4)	0 (0.0)	
• Hypoactive delirium	7 (14.6)	10 (22.7)	
• Mixed type			

Table 6
The primary outcomes stratified by dementia.

	Dementia			Non-Dementia		
	PRE - FT	FT	p value	PRE - FT	FT	p value
Post-operative complication, n (%)	25 (78.1)	29 (58.0)	0.061	23 (21.1)	15 (16.3)	0.387
• Delirium	3 (9.4)	5 (10.0)	0.926	7 (6.4)	7 (7.6)	0.742
• Pneumonia	9 (28.1)	16 (32.0)	0.710	12 (11.0)	14 (15.2)	0.376
• Urinary tract infection	7 (21.9)	7 (14.0)	0.355	11 (10.1)	10 (10.9)	0.857
• Pressure injury/ IAD	0 (0.0)	1 (2.0)	0.421	1 (0.9)	0 (0.0)	0.357
• Stroke/TIA	1 (3.1)	1 (2.0)	0.747	0 (0.0)	1 (1.1)	0.275
• Myocardial infarction	0 (0.0)	1 (2.0)	0.421	0 (0.0)	0 (0.0)	-
• Deep vein thrombosis	0 (0.0)	1 (2.0)	1.000	0 (0.0)	0 (0.0)	-
• Pulmonary embolism	6 (18.8)	10 (20.0)	0.889	0 (0.0)	0 (0.0)	0.606
• Pain score > 4	19 (59.4)	31 (62.0)	0.812	32 (29.4)	24 (26.1)	0.674
• Anemia (Blood transfusion)				53 (48.6)	42 (45.7)	

The secondary outcomes were summarized in Table 7. The length of stay in the Fast-track group was significantly shorter (11(8–17) VS 13(9–18), p = 0.017). However, there was no significant difference between hospital mortality and long term mortality. Most patients in both groups were discharged to home. The readmission rates in both groups were all similar. The information about the patient's function (Barthel index) at day 4, month 3 and month 12 after the operation was collected. The Barthel index of patients in both groups were subsequently improved after discharging to home, but there was no difference in the Barthel index between group in Table 7.

Table 7
The secondary outcomes.

	PRE – Fast track (n = 151)	Fast-track (n = 151)	p value
Re – operation, n (%)	1 (0.7)	2 (1.4)	1.000
Length of stay, Median (25–75)	13 (9.75-18)	11 (8–17)	0.017
Hospital mortality, n (%)	5 (3.3)	4 (2.6)	0.735
Discharge ambulation status, n (%)	25 (17.1)	31 (27.1)	0.326
• Wheelchair	112 (76.7)	112 (76.2)	
• Walker	2 (1.4)	0 (0.0)	
• Crutch	7 (4.8)	4 (2.7)	
• Unable to ambulate			
Destination of discharge, n (%)	143 (97.9)	144 (98.0)	0.223
• Home	1 (0.7)	3 (2.0)	
• Nursing home	2 (1.4)	0 (0.0)	
• Refer			
Re – admission in 1 year., n (%)	n = 146	n = 147	0.445
• ≤ 90 days	9 (6.1)	15 (10.2)	
• > 90 days	18 (12.3)	20 (13.6)	
Mortality, n (%)	8 (5.3)	9 (6.0)	0.803
• 3 months	12 (7.9)	16 (10.6)	0.427
• 6 months	14 (9.3)	20 (13.2)	0.275
• 1 year			
Function (Barthel index), Median (25–75)	45 (25.00-66.25)	50 (30.00–60.00)	0.617
• Post op day 4 (n = 275)	80 (65.00–95.00)	90 (65.00-100.00)	0.100
• 3 months (n = 250)	90 (65.00-100.00)	100 (65.00-100.00)	0.066
• 12 months (n = 264)			

Discussion

This study has demonstrated the outcome of implementing a multidisciplinary team for caring of hip fracture older patients in a large referral center university hospital in resource limited settings. The

implementation was successful for accelerating the operation time and reducing length of stay. However, benefits on patient-centered outcomes were not demonstrated in this analysis contrast to several existing evidences[13, 30]. This finding might stem from several factors.

Outcomes including in-hospital complications after implementation of the Siriraj Hip fracture Fast Track System were analyzed. There was no statistical difference in the incidence of delirium between pre- and post-implementation of the program. Published studies reporting reductions in post-operative medical complications, delirium and in-hospital mortality mainly occurred in settings with routine geriatric consultation[10, 12, 13, 17, 19, 21, 31, 32]. In Siriraj hospital, geriatric consultation was already common practice (96%) before the Fast-track program was implemented. This may have contributed to the inability to detect important differences following implementation of the program. Moreover, the overall incidence of post-operative delirium in the study was approximately 32%, lower than the 45% rate reported by a previous study in a similar Thai population[33] and lower than rates reported by studies in other countries[10, 34–37]. This might indicate that the existing care in the PRE-fast track era was already at a standard level of care for delirium reduction.

The prevalence of dementia in this study was significantly higher in the Fast-track group (37.1% VS 23.8%, $p < 0.012$) and higher than that reported by earlier studies[12, 31, 33, 36]. Dementia has a significant impact on post-operative complications including delirium[36, 38], so a post-hoc analysis according to dementia status was performed. The analysis revealed a non-significant trend of delirium reduction for both demented group and non-demented one after the program was implemented. The incidence of pressure injury was also lower in the demented population in the Fast-track group. This makes clinical sense because delirium and pressure injury may result from inadequate pain control and prolonged immobilization. The Fast-track program was designed to prevent these undesirable symptoms.

The incidences of pneumonia, urinary tract infection, and pressure injury were higher than those in the previous studies[13, 17, 39] and were not reduced after the program had been implemented. Early ambulation is considered one of the most valuable postoperative strategies to reduce postoperative pneumonia and pressure injury[26, 40]. Early ambulation was more common in the Fast-track group, but the statistically significant reductions in post-surgical complications were not observed. Barriers could possibly stem from the attitudes of involved healthcare staff, availability of therapists, or the patients' condition. A more comprehensive plan of barrier reduction from all involved parties with more practical strategies to apply the program might improve engagement and outcomes.

Moreover, during the first few months of the Fast-track program, the Acute Pain Service (APS) was not fully operational and some patients might not obtain the optimal pain control. Complications such as delirium and inadequate rehabilitation were also more common before the APS was fully implemented.

Hip fractures in elderly people reduce short-term mobility and long-term functional outcomes [41, 42 43]. The functional outcomes was measured by using the Barthel index. Although, there were no significant difference in the Barthel index for all comparisons between groups but there was a trend toward better

function in the Fast-track group. Moreover, most patients achieved improved functional outcomes over time and the majority reached full mobility at 1 year, which has been better results than other studies[44]. Discharge destination might contribute to mobility status, and most of the patients in this study were discharged back to home. In other studies, most of the patients were discharged to institutional care.

Debate on time to surgery for hip fracture surgery remains, not for the benefit of expedited surgery but rather the optimal time of how fast the time should be[23, 45, 46]. Most studies appears to indicate the 'optimal time' at 48 hours following the cutoff points utilized in meta-analyses[46]. Some important difficult-to-measure confounding factors might be the patient's risk for experiencing medical complications and other negative clinical consequences and the accompanied care provided in different settings. Patients included in the present study, conducted in a large referral center have more co-morbidities with higher Charlson comorbidity index compared to previous studies[17, 47]. However, in this study, there was a similar rate of medical complications for the whole cohort compared to other studies in other settings. This might be one reason that we could not demonstrate the difference in primary outcome as we have reached the ceiling for reducing some complications. Having said this, there were rooms for improving the program shown in the results. The rate of involvement of main specialties in the program remain low in some context and might contribute to the results observed. In the present cohort, the decisions to undergo surgery were based on agreement of all involved specialists for each patient. The delayed time to surgery might be to optimize medical conditions for the patients. To achieve ultimate goal for the Fast-track program, we should focus on the orchestrating implementation of all involved disciplines, as well.

Strengths And Limitations

Our study has several strengths. Data for this study was collected from several sources, including a prospective registry (FLS). Data regarding related medical complications and possible interventions were explored to identify the gap of practice. The selection of consecutive cases would reduce the selection bias for this study. Limitations of the study include its retrospective design, which may have resulted in the under ascertainment of delirium; nevertheless, several measurements were taken to ensure that all cases would be identified.

Conclusion

We demonstrated the feasibility of implementing comprehensive multidisciplinary care team approach in a large referral center, teaching hospital with complex administrative structures in resource-limited settings. The Fast-track program reduced the length of hospital stay and time to surgery. With respect to patients' outcome, the reduction of the prevalence of delirium in demented patients and the better post-operative patient function were observed although the outcomes of this study were not statistically significant. Several interventions in the program were not implemented as planned. A better embarking rate of all interventions might improve the mortality rate in this group of population.

Declarations

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Availability of data and materials

The datasets used and/or analysed the current study are available from the corresponding author on reasonable request.

Authors' contributions

US, VS contributed to the study design, concept of this work, interpretation of data, and approval for final version of the article. TT, AU and DT contributed to the concept of this study and approval for the final version of the article. All authors have read and approved the manuscript.

Ethics approval and consent to participate

This study was approved by the ethics committee of Siriraj hospital Institutional Review Board (reference number Si411/2019). The Siriraj Institutional Review Board considered this study as an expedited category.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

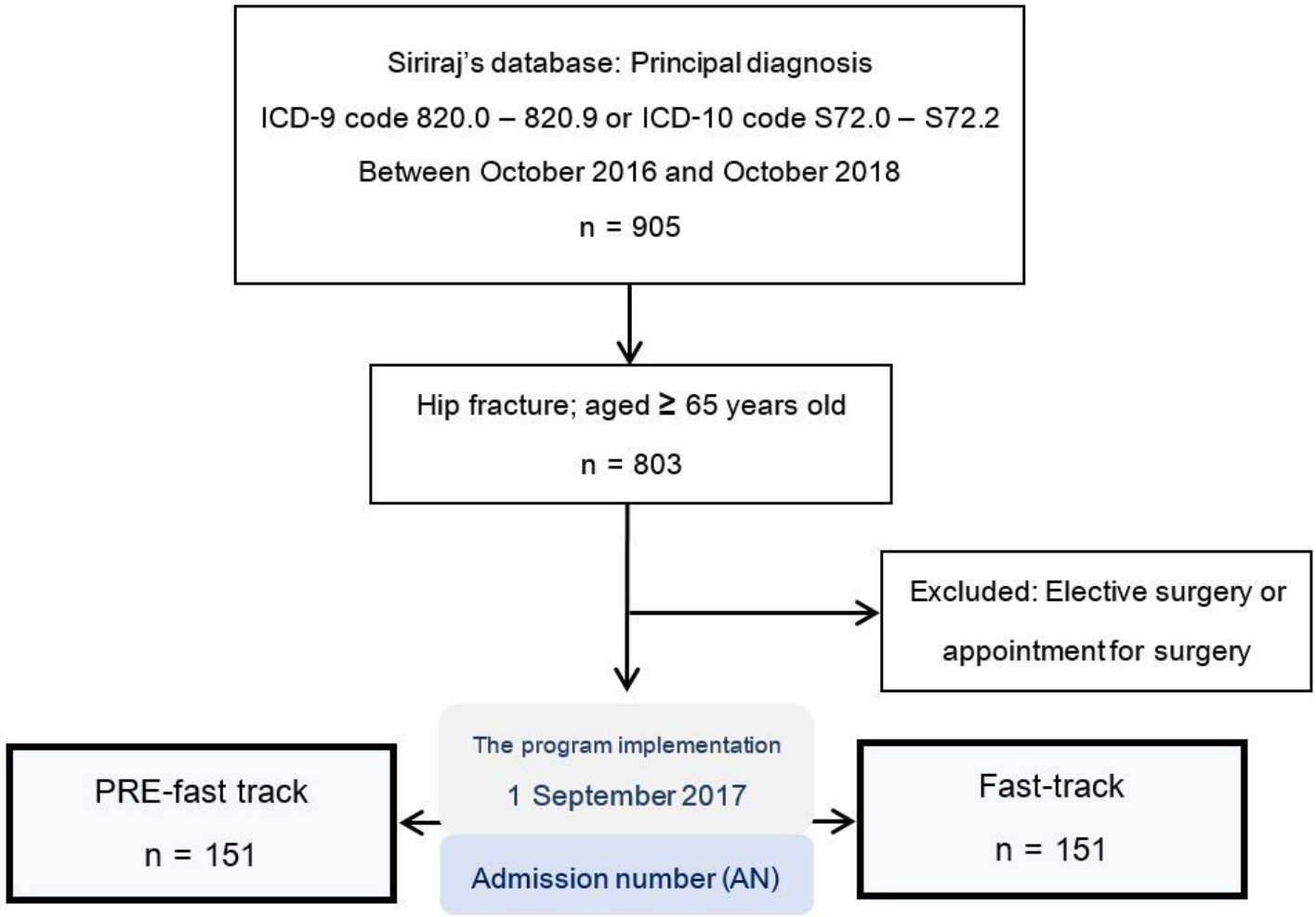

Figure 1

Subject selection flow chart.