Loss to follow-up after surgery in patients with hip fractures

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Abstract

Background: Non-attendance with scheduled postoperative follow-up visits remains a common problem in orthopaedic clinical researches. The goal of this study was to determine the risk factors for loss to follow-up of hip-fracture patients postoperatively.

Methods: A 1-year postoperatively retrospective analysis was conducted on patients who underwent surgery for hip-fractures between January 2017 and December 2018. According to whether they finished the appointed follow-up schedule, the patients were divided into two groups: LTFU Group (Follow-up loss group) and FU Group (Follow-up group). Electronic Medical Records (EMR) was examined to identify the patients' variables of interest and telephone or text message interviews were attempted on those who didn't return for follow-up to determine the reasons for loss to follow-up. The baseline characteristics between the 2 groups were compared and the statistical differences were analyzed by logistic regression.

Results: 1041 patients met the inclusion criteria were included in this study, of which 212 (20.37%) were lost to follow-up at 1 year postoperatively. The logistic regression analysis showed that old age at surgery, fracture type, distance to hospital, HA surgery and patients transport to hospital by urban-rural public traffic or bus were found to be risk factors for noncompliance with the follow-up visit. As for the reasons for loss to follow-up in in LTFU Group, 75 patients (35.4%) claimed symptoms improvement, 43 (20.3%) cited difficulties of transportation to hospital, 23 (10.8%) chose other health care institutions, and 57 (26.9%) couldn't travel to hospital alone. Other reasons including thinking follow-up was unnecessary (n=4, 1.8%), no spare time (n=5, 2.4%) and financial problems (n=5, 2.4%).

Conclusion: Loss to follow-up was common in patients with hip-fracture postoperatively. Our study suggested advanced age, difficult transport, long distance, fracture type and surgical procedures were risk factors for noncompliance.

Introduction

With the acceleration of population aging and increased traffic accidents, the incidence of hip fractures is rising. The population of hip fractures per year is expected to increase to 2.6 million in 2025 and to 6.3 million by 2050 [1, 2]. Hip fractures always generated complicated adverse outcomes and resulted in high mortality [3]. To evaluate patients' clinical effects and to seek optimal treatment protocol, regular clinical follow-up is necessary [4, 5]. For patients with hip fracture surgery, routine postoperative follow-up consist of assessing fracture healing and joint prosthesis function, guiding patients on functional training instructions. More importantly, with routine postoperative follow-up, potential problems such as failure of fixation, component loosening, fracture non-unions and surgical site infection would not be treated in delayed mode. Unlike patients with chronic diseases, who were naturally motivated to return to the clinic for continuous long-term treatment management (e.g., prescription refills, medicine adjustment, etc.). Lost to follow-up (LTFU) is a commonly encountered problem in orthopaedic clinical researches [5–9]. LTFU in clinical researches may reduce the sample size and generate inaccurate conclusions if the

current status of LTFU patients is unknown [10–12]. Moreover, high LTFU rate might generate study response bias and undermine the validity of the observations [13]. To address this problem, many investigations had been undertaken to explore the risk factors for non-adherence with postoperative follow-up. Factors associated with LTFU in previous studies included age, sex, educational level, financial issues, smoker, transportation barriers, distance to clinic, time commitment, etc.. [5, 14–19] On the other hand, considering that follow-up was not necessary, some patients refused to follow up because of dissatisfaction with treatment [8, 20, 21].

Previous studies had suggested that those who lost to follow-up equated to a poor outcome [10, 22]. In a prospective study including 224 patients with rotator cuff tear, it was reported that 102 patients (46%) were lost to follow-up. Compared to those who followed up, the 102 patients had worse shoulder functions in their last functional assessment questionnaires [10]. Similarly, Murray et al. [22] conducted a study including 2268 patients who underwent total hip arthroplasty, a cumulative loss of follow-up rate at 15 years postoperatively was observed. In their series, patients lost to follow-up had worse pain, range of movement and worse radiological features than those who were not lost. To our knowledge, there were few studies concerning the reasons for hip-fracture patients who were lost to follow-up after surgery. Identifying these patients lost to follow-up would improve validity and generalizability of clinical research. Moreover, researchers could provide additional resources to these areas, if specific populations were at risk of being lost to follow-up. Therefore, the purpose of the present study was to determine the demographic and clinical features of the population who were more likely to be lost to follow-up.

Materials And Methods

This research was reviewed and approved by the Ethical Committee of hospital. A retrospective review of patients who were operated for a hip fracture (femoral neck fracture and intertrochanteric fracture) between January 2017 and December 2018 was conducted with Electronic Medical Records (EMR). Before discharge, all the patients were asked to follow up at 1, 2, 3, 6 months and 1 year after surgery. Discharge instructions including follow-up schedule were handed and explained to the patients. The follow-up instructions included interval of follow-up appointments, the name of their physicians, the phone number of clinic, and the directions to the clinic. It was probable that a patient might attend one appointment, missed one and then appeared at the following appointment. Therefore, if a patient missed one appointment, but rescheduled within 2 weeks, the patient was considered compliant. Patients who missed their scheduled follow-up appointment were contacted by phone calls to remind them of their appointments and to reschedule their appointments. Moreover, up-to-date locations, phone numbers and status of patients were checked at each contact. A Patient was defined as lost to follow-up if the patient missed three consecutive follow-up appointments, or canceled an appointment and refused to reschedule a follow-up appointment after telephone call reminders, or claimed reasons for not return to clinic.

Accordingly, based on follow-up status, they were classified into two groups: LTFU Group (Follow-up loss group) and FU Group (Follow-up group). The patients who died during follow-up period and those could not be analyzed by surgeons due to incomplete data were excluded. Using clinical records, the baseline

characteristics of the patients and potential predictors for follow-up loss (e.g., age at the time of surgery, gender, employment status, living status and payment type of medical expenses) were analyzed. The payment type was categorized into Medicare (Employee health care insurance), Medicaid (Rural cooperative medical insurance), other insurances (e.g., commercial insurance and worker's compensation) and self-pay. And the distance from residence to hospital was measured by Google maps (http://www.google.cn/maps). Fracture type and operation methods were also recorded. In addition, telephone and/or text message survey were conducted with patients or their family members who were lost to follow-up for investigating their main reason for non-attendance and their current contact information.

Statistical analysis

Statistical analysis was conducted with SPSS software (ver. 18.0; SPSS Inc., Chicago, IL, USA). The Kolmogorov-Smirnov test was utilized to verify whether quantitative variables were normal distribution. Normally distributed data were presented as means and skewed data as medians. The Mann-Whitney U test was used to compare the quantitative variables between the two groups. The Chi-square test or Fisher's exact test was used to compare qualitative variables as appropriate. Logistic regression models were used to determine which risk factors were predictor variables of loss to follow-up. Confidence intervals (CIs) were presented at the 95% level and the significance level was $\alpha = 0.05$. $P < 0.05$ were considered as statistically significant.

Results

Between January 2017 and December 2018, a total of 1297 patients received operation due to hip fractures in our trauma center. Of which, 201 patients died within one year postoperatively and 55 patients were excluded due to incomplete information or non-response. Finally, 1041 individuals satisfied the inclusion and exclusion criteria were included in the study. Of the 1041 patients, 212 (20.37%, 85 men and 127 women) were considered lost to follow-up and allocated to LTFU Group and 829 (79.63%, 294 men and 535 women) to FU Group (Fig. 1). The mean age in LTFU Group was 76.70 ± 12.78 (30–97 years),and 71.31 ± 13.87 (19–95 years) in FU Group respectively ($P < 0.001$). There were no differences with regard to sex, employment status or living status between the two groups (Table 1).

Table 1
Baseline characteristics of the 2 groups

	LTFU Group (n = 212 20.37%)	FU Group (n = 829 79.63%)	P value
Age at surgery (years†) (range)	76.70 ± 12.78 (30–97)	71.31 ± 13.87(19–95)	< 0.001*
Gender	85(40.1%)	294(35.5%)	0.211
Male Female	127(59.9%)	535(64.5%)	
Fracture type (n, %)	147(69.3%)	388(46.8%)	< 0.001*
Femoral neck fracture	65(30.7%)	441(53.2%)	
Intertrochanteric fracture			
Surgical procedures (n, %)	72(34.0%)	469(56.6%)	< 0.001*
Internal fixation	50(23.6%)	147(17.7%)	
Total hip arthroplasty (THA)	90(42.4%)	213(25.7%)	
Hemiarthroplasty (HA)			
Employment status (n, %)	32(15.1%)	164(19.8%)	0.119
Employed	180(84.9%)	665(80.2%)	
Unemployed			
Payment type of medical expenses (n, %)	56(26.4%)	296(35.7%)	0.014*
Employee health care insurance	116(54.7%)	397(47.9%)	
Rural cooperative medical insurance	10(4.7%)	79(9.5%)	
Other insurances	30(14.2%)	57(6.9%)	
Self-paying			
Means of transport to hospital (n, %)	4(1.9%)	57(6.9%)	0.009*
Walk/ wheelchair	38(17.9%)	140(16.9%)	
Bus	155(73.1%)	601(72.5%)	
Private car	15(7.1%)	31(3.7%)	
Urban-rural public traffic			

† Mean values

‡ Median, IQR = interquartile range

* $P < 0.05$

	LTFU Group (n = 212 20.37%)	FU Group (n = 829 79.63%)	P value
Living status (n, %)	31(14.6%)	84(10.1%)	0.063
Alone	181(85.4%)	745(89.9%)	
Not alone			
Distance from residence to hospital(Km‡) (IQR)	17.50(7.48–27.60)	9.70(3.60-20.35)	< 0.001*
† Mean values			
‡ Median, IQR = interquartile range			
* $P < 0.05$			

The Table 2 showed the results of analysis in a logistic regression model. According to the analysis, advanced age at surgery (OR = 1.055, 95%CI (1.035–1.076), $P < 0.001$), fracture type (OR = 0.380, 95%CI (0.145–0.993), $P = 0.048$), distance to hospital (OR = 1.048, 95%CI (1.030–1.066), $P < 0.001$), HA surgery (OR = 1.743, 95%CI (1.042–2.918), $P = 0.034$), patients transport to hospital by urban-rural public traffic (OR = 0.210, 95%CI (0.058–0.753), $P = 0.017$) or bus (OR = 0.351, 95%CI (0.183–0.675), $P = 0.002$) were identified as risk factors for noncompliance with the follow-up visit. But no statistically significant difference were found concerning the surgical procedures of internal fixation and THA, and payment type of medical expenses in the logistic regression ($P > 0.05$).

Table 2
Logistic regression analysis for loss to Follow-up one year postoperatively

Variables	B	S.E.	Wald	OR (95%CI)	P value
Age at surgery	0.054	0.010	28.857	1.055(1.035–1.076)	< 0.001*
Payment type					
Employee health care insurance				1.000	
Rural cooperative medical insurance	0.354	0.499	0.502	1.424(0.535–3.789)	0.479
Self-paying	0.354	0.489	0.525	1.425(0.547–3.715)	0.469
Other insurances	0.854	0.531	2.583	2.348(0.829–6.650)	0.108
Fracture type	-0.968	0.49	3.898	0.380(0.145–0.993)	0.048*
Surgical procedures					
Internal fixation				1.000	
Total hip arthroplasty (THA)	-0.045	0.479	0.009	0.956(0.374–2.442)	0.925
Hemiarthroplasty (HA)	0.556	0.263	4.475	1.743(1.042–2.918)	0.034*
Distance	0.047	0.009	28.134	1.048(1.030–1.066)	< 0.001*
Transport to hospital					
Walk/wheel chair				1.000	
Bus	-1.563	0.653	5.736	0.210(0.058–0.753)	0.017*
Private car	– .459	0.400	1.320	0.632(0.289–1.383)	0.251
Urban-rural public traffic	-1.047	0.333	9.864	0.351(0.183–0.675)	0.002*
CI, Confidence Interval; OR, Odds Ratio; S.E., Standard Deviation					
* $P < 0.05$					

The reasons for follow-up loss were identified for 212 patients in LTFU Group (Table 3). It was showed that the most common reason for not returning to the clinic was symptoms improvement and satisfaction with clinical results (n = 75,35.4%). Forty-three (20.3%) patients stated the reasons for not continuing follow-up were long distance to hospital and difficulties of transportation (n = 43, 20.3%). And 23 (10.8%) patients responded that they had chosen an alternate health care institution. Besides, 57 (26.9%) patients declared that they withdrew follow-up because they couldn't travel due to other infirmity and/or advanced age. Other reasons of loss to follow-up were: the belief that follow-up was unnecessary (n = 4, 1.8%), inability to take time off (n = 5, 2.4%), financial problems (n = 5, 2.4%).

Table 3
Primary reasons for follow-up loss

Reasons	N	Percent (%)
Symptoms improvement	75	35.4
Difficulties of transportation to hospital	43	20.3
Change health care institution	23	10.8
Lack of ability to hospital	57	26.9
Other reasons	14	6.6
*All patients stated one main reason		

Discussions

Patients' loss to follow-up seemed to be a common phenomenon in clinical orthopaedic studies [10, 18, 23]. It has been suggested that lower than 5% loss probably leaded to little bias, whereas greater than 20% loss might potentially pose serious threats to the sensitivity and the validity of the data in research [24]. From the clinical standpoint, patients discontinued to follow-up might have worse function and poorer prognosis [10, 22, 25]. From the investigative perspective, loss of follow-up would potentially bring about bias, decrease statistical power [11, 26, 27], and lead to underestimates or overestimates of therapeutic effects [28, 29]. Based on an analysis of 235 published reports, a systematic review concluded that plausible hypotheses about patients' outcomes of LTFU could change the interpretation of results of randomized controlled trials [30].

Many factors including socio-economic demographic features and patients' related factors might impact patients' follow-up after surgery. It was found that the average age in LTFU group was higher than that in FU group ($P < 0.001$). Older patients were more likely to be lost to follow-up in our study. Compared with the elderly, younger patients might be easier to attend follow-up visits on their own without relying on their family members. Berg and Ring found that unmarried status (single or divorced) and unemployment status were independent predictors of loss to follow-up in a cohort study of 335 patients treated for metacarpal fractures [5]. They considered it attributed to social deprivation [5, 31–33]. But 89.9% patients in FU group and 85.4% in LTFU group didn't live alone, and 84.9% in FU group and 80.2% in LTFU group were unemployed in our study. The patients' age and living status of ours were significantly different from theirs, which greatly reduced the impact of social deprivation on follow-up. Additional risk for loss to follow-up related to fracture type and surgical methods. It was suggested that patients with femoral neck fracture and those who underwent hemiarthroplasty were more likely to be loss of follow-up. In Norquist et al's research, patients treated non-operatively were significantly more likely to be non-responders [10]. Similarly, in a follow-up study of patients with distal radius fractures, it was also showed that patients with non-surgical treatment were less likely to follow-up [16]. However, all the patients in our study were treated surgically. The probable reason might be that, patients with femoral neck fracture underwent

hemiarthroplasty were older than those underwent internal fixation or THA, which made them less likely to follow-up. On the other hand, compared with those with intertrochanteric fracture, they could weight-bearing move early after operation and were more likely feeling well.

In our series comprised of 1041 patients, 212(20.37%)were lost to follow-up, which was similar to previously reported LTFU rates [19, 34]. LTFU was thought associated with poor clinical outcomes under the assumption that the patients might be unsatisfied and quested for further care elsewhere. Murray et al. declared that patients underwent total hip arthroplasty who lost to follow-up had worse outcomes and radiographic features [22]. Joshi et al. [35] found lower failure rates of revision surgery and higher satisfactory results in patients lost to follow-up compared with those had completing follow-up after total knee arthroplasty. Therefore, they thought that the patients who didn't continue follow-up visits did not necessarily have poor results. A national multicenter follow-up study suggested that the improvement of patients' symptoms during follow-up may lead them to believe that follow-up was no longer necessary [36]. Similarly, a notable finding in our study was that more than 1/3 patients in LTFU group (75/212, 35.4%) were satisfied with treatment results and discontinued the scheduled follow-up by their own decision, when they were asked for the reasons of noncompliance with clinic visits.

Previous studies from traumatic surgery and emergency medicine found that distance to hospital and transportation expense were important factors for noncompliance with follow-up [37, 38]. Geng et al. also concluded that inconvenient transportation and long distance to clinic were the most common reasons for not continuing follow-up [39]. Similar to previous literatures, distance to hospital correlated with our patients' noncompliance with scheduled follow-up, and patients from LTFU group lived further away from the hospital. Inversely, 307 patients underwent surgical treatment after orthopaedic injuries were analyzed retrospectively, and there was no correlation between distance from the hospital and noncompliance [17]. But the geographic area that their trauma center served was relatively larger than ours, which generated possible further effect on patients' traffic affairs, that making more patients loss of follow-up. Due to the difficulty to calculate the transportation costs accurately, we only recorded the way to hospital. It was found that convenience of patients' coming to follow-up was the main reason, as the patients LTFU were more likely to take traffic coach or bus to hospital. Moreover, with infirmity or advanced age, many patients (26.9%) from LTFU group declared that they had no ability to follow up, which also explained that convenience did play an important role. And 23 (10.8%) patients in LTFU group responded that they chose an alternate health care institution, due to inconvenience to our hospital. Finally, in our study, the payment methods of patients' medical expenses were also analyzed. Although the proportion of patients with rural cooperative medical insurance or at their own expense were higher in LTFU group, but no statistic difference were found in the logistic regression analysis. It was different from the observations by Berg and Zelle, lack of commercial health insurance was associated with the risk of noncompliance [5, 17]. It might be related to different medical costs and insurance systems in each region, which still needed further study.

Our study had several potential limitations. Firstly, our study was a retrospective cohort study that was inherently limited by data collection and sample size. Another inherent issue in this study was its

dependence on accurate entry of databases. Therefore, we were unable to analyze other potential factors (e.g. life style, household income [40], education level [41]) due to lack of detailed information. Secondly, as the significant socioeconomic and geographic differences, the findings in our study might not necessarily generalize to other clinics. Moreover, as 1-year follow-up visit was considered as a main observation time point in most clinical research, our study focused on incomplete regular attendance within the first 1 year after surgery. Hence, we could not make any assumptions about nonattendance with long-term follow-up. Moreover, our study merely provided information on the demographics of hip-fracture patients after operation. Therefore, we could not make any assumptions about patients by conservative treatment, who were at high risk for noncompliance with their follow-up visits. Finally, the collection of patients' questionnaire data in the present study was conducted more than 1 year after surgery, and therefore it could lead to recall bias by patients.

In conclusion, loss to follow-up was a common problem in patients underwent surgery for hip fractures. Our research indicated that there were multiple reasons for noncompliance. Advanced age, fracture type, long distance and inconvenience to hospital were risk factors of loss to follow-up at 1 year postoperatively. It was also suggested that most patients lost to follow-up after surgery were likely satisfied with their clinical results and might think it unnecessary for further follow-up.

Abbreviations

1. LTFU: Lost to follow-up
2. EMR: Medical Records
3. FU :Follow-up
4. CI: Confidence interval
5. THA: Total hip arthroplasty
6. HA: Hemiarthroplasty
7. IQR: interquartile range
8. OR: Odds Ratio
9. SE.: Standard Deviation

Declarations

Ethics approval and consent to participate

The research proposal (IRB: 2016-0157) was approved by the Ethics Committee of the Affiliated Jiangyin Hospital of Southeast University. Informed consent was obtained from all subjects or, if subjects are under 18, from a parent and/or legal guardian.

Consent for publication

Not Applicable.

Availability of data and materials

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

Competing interests

On behalf of all authors, the corresponding author states that there is no Competing interest.

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Authors' contributions

Min Rui and Xin Zheng designed the study. Min Rui wrote the manuscript. Yajun Ren, Dong Lu, Xingye Du, Jianguo Shen, Peng Kan, Yujian Hui, and Kewei Ren collected and analyzed the data. Jiaye Gu provided essential advice during the writing process. All authors have approved the final version of the manuscript.

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Figures

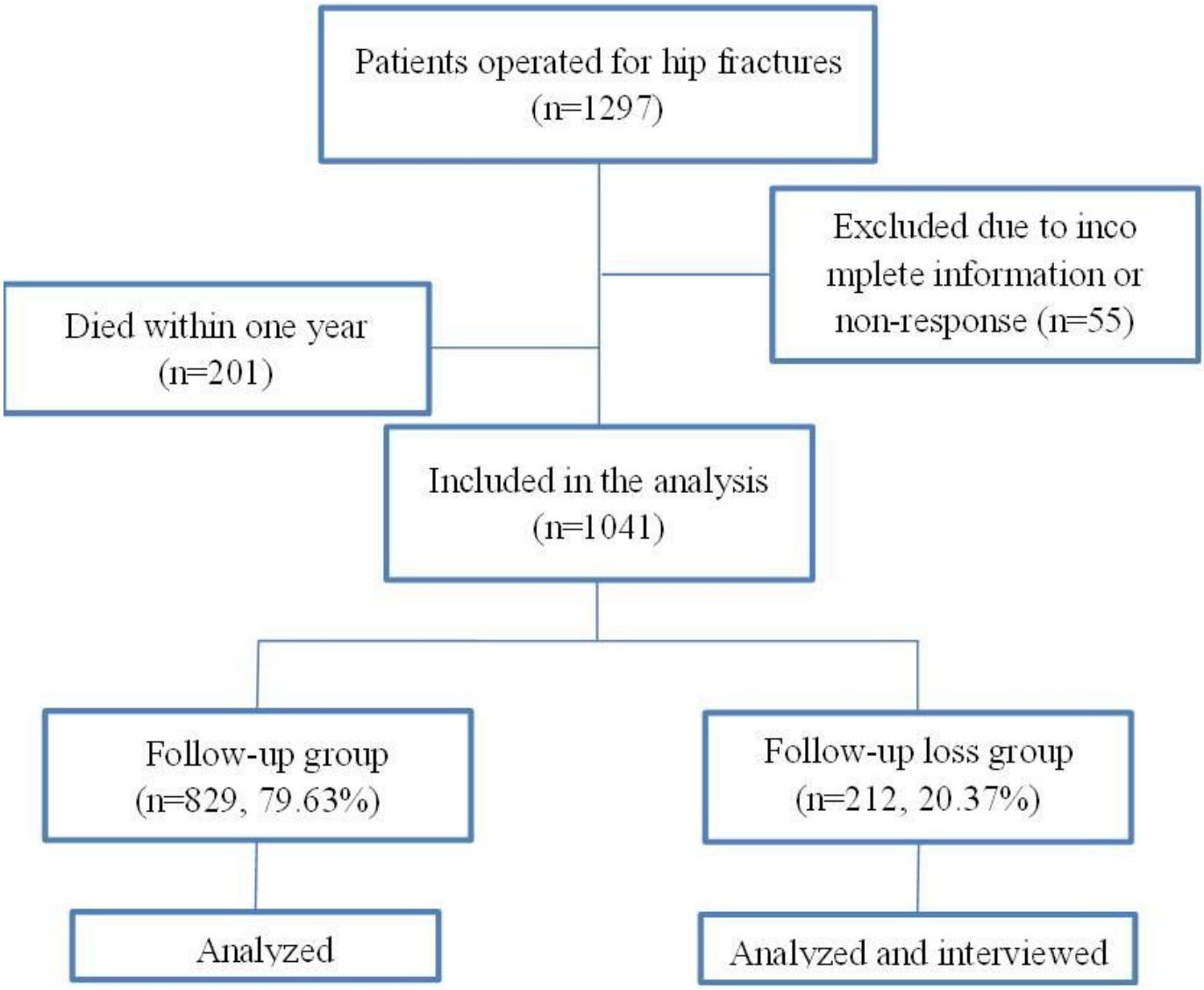

Figure 1

The consort flow diagram