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## Supplementary Material

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**Characteristics of patients for complete case analysis by subgroups, and for patients included and excluded from complete case analysis**

**Table i.** Characteristics of patients surgically treated for non-pathological first hip fracture by timing of mobilization and by dementia in the complete case analysis of survival outcome (n = 121,433).

Variable	Without dementia (n = 85,056)		With dementia (n = 36,377)	
	Early mobilization (n = 69,150)	Late mobilization (n = 15,906)	Early mobilization (n = 26,111)	Late mobilization (n = 10,266)
Median age, yrs (IQR)	82 (75 to 88)	84 (77 to 89)	86 (82 to 91)	87 (82 to 91)
<b>Sex, n (%)</b>				
Female	50,044 (81.7)	11,232 (18.3)	19,386 (72.5)	7,360 (27.5)
Male	19,105 (80.3)	4,674 (19.7)	6,725 (69.8)	2,905 (30.2)
Missing	1 (100.0)	0 (0.0)	0 (0.0)	1 (100.0)
<b>Ethnicity, n (%)</b>				
White	57,034 (82.2)	12,382 (17.8)	21,914 (72.6)	8,255 (27.4)
Caribbean or African (Black or Black British) or any mixed black background	104 (68.0)	49 (32.0)	55 (60.4)	36 (39.6)
Asian or Asian British or any mixed Asian background	796 (80.0)	199 (20.0)	174 (65.2)	93 (34.8)
Missing	11,216 (77.4)	3,276 (22.6)	3,968 (67.8)	1882 (32.2)
<b>Deprivation, n (%)</b>				
Least deprived 10%	5,955 (80.8)	1,416 (19.2)	2,239 (70.5)	935 (29.5)
Less deprived 10-20%	5,657 (79.7)	1,441 (20.3)	2,282 (70.5)	955 (29.5)
Less deprived 20-30%	6,112 (79.6)	1,569 (20.4)	2,538 (71.0)	1,035 (29.0)
Less deprived 30-40%	6,702 (80.7)	1,604 (19.3)	2,640 (71.0)	1,077 (29.0)
Less deprived 40-50%	7,185 (81.3)	1,653 (18.7)	2,689 (71.1)	1,091 (28.9)
More deprived 40-50%	7,536 (81.2)	1,743 (18.8)	2,894 (71.7)	1,142 (28.3)
More deprived 30-40%	7,545 (81.5)	1,717 (18.5)	2,792 (71.8)	1,095 (28.2)
More deprived 20-30%	7,408 (82.1)	1,615 (17.9)	2,660 (72.3)	1,018 (27.7)
More deprived 10-20%	7,363 (82.4)	1,575 (17.6)	2,732 (74.2)	952 (25.8)
Most deprived 10%	7,120 (83.2)	1,434 (16.8)	2,467 (73.5)	889 (26.5)

Missing	567 (80.3)	139 (19.7)	178 (69.8)	77 (30.2)
<b>Prefracture ambulation, n (%)</b>				
Outdoor ambulation	58,336 (83.4)	11,648 (16.6)	15,174 (75.6)	4,905 (24.4)
indoor ambulation	9,792 (72.2)	3,768 (27.8)	9,984 (67.7)	4,761 (32.3)
No functional ambulation	487 (61.6)	304 (38.4)	485 (56.8)	369 (43.2)
Missing	535 (74.2)	186 (25.8)	468 (67.0)	231 (33.0)
<b>Hip fracture type, n (%)</b>				
Intracapsular	41,766 (82.2)	9,045 (17.8)	14,924 (71.5)	5,953 (28.5)
Intertrochanteric	23,388 (80.8)	5,562 (19.2)	9,940 (72.8)	3711 (27.2)
Subtrochanteric	3,967 (75.4)	1,293 (24.6)	1,231 (67.5)	594 (32.5)
Missing	29 (82.9)	6 (17.1)	16 (66.7)	8 (33.3)
<b>Indicator of surgery within target time of 36 hours, n (%)</b>				
Within target time	49,731 (82.5)	10,582 (17.5)	19,272 (72.5)	7,303 (27.5)
Not within target time	14,976 (77.9)	4,238 (22.1)	5,278 (69.1)	2,362 (30.9)
Missing	4,443 (80.4)	1,086 (19.6)	1,561 (72.2)	601 (27.8)
<b>Type of procedure, n (%)</b>				
Internal fixation	33,645 (81.3)	7,758 (18.7)	12,976 (72.8)	4,837 (27.2)
Hemiarthroplasty	27,532 (79.6)	7,075 (20.4)	12,747 (70.7)	5,287 (29.3)
Total hip arthroplasty	7,717 (88.7)	979 (11.3)	291 (78.9)	78 (21.1)
Missing/Other	256 (73.1)	94 (26.9)	97 (60.2)	64 (39.8)
<b>Location prior to hospitalization, n (%)</b>				
Own home/sheltered housing	64,058 (82.2)	13,863 (17.8)	13,859 (75.3)	4,544 (24.7)
Nursing care/residential care	4,009 (72.1)	1,555 (27.9)	11,409 (68.4)	5,278 (31.6)
Missing	1,083 (68.9)	488 (31.1)	843 (65.5)	444 (34.5)
<b>Calendar year of surgery, n (%)</b>				
2014	18,926 (80.1)	4,699 (19.9)	6,927 (71.1)	2,809 (28.9)
2015	26,112 (81.7)	5,859 (18.3)	9,798 (72.9)	3,642 (27.1)
2016	24,112 (81.8)	5,348 (18.2)	9,386 (71.1)	3,815 (28.9)
<b>Weekday of admission, n (%)</b>				
Weekday (Monday to Friday)	46,476 (81.2)	10,758 (18.8)	17,195 (71.9)	6,717 (28.1)

Weekend (Saturday to Sunday)	20,529 (82.7)	4,281 (17.3)	8,232 (72.8)	3,073 (27.2)
Missing	2,145 (71.2)	867 (28.8)	684 (59.0)	476 (41.0)
<b>Hospital volume, n (%)</b>				
High volume	35,356 (81.1)	8,253 (18.9)	13,617 (71.5)	5,427 (28.5)
Medium volume	15,462 (82.8)	3,214 (17.2)	6,000 (74.4)	2,063 (25.6)
Low volume	18,332 (80.5)	4,439 (19.5)	6,494 (70.1)	2,776 (29.9)
<b>ASA grade, n (%)</b>				
Normal healthy individual	2,306 (91.0)	228 (9.0)	102 (84.3)	19 (15.7)
Mild systemic disease that does not limit activity	24,193 (86.8)	3,687 (13.2)	3,512 (78.4)	966 (21.6)
Severe systemic disease that limits activity but is not incapacitating	35,088 (79.9)	8,830 (20.1)	17,042 (72.6)	6,422 (27.4)
Incapacitating systemic disease which is constantly life-threatening	5,853 (68.2)	2,723 (31.8)	4,679 (64.5)	2,577 (35.5)
Moribund - not expected to survive 24 hours with or without surgery	83 (60.6)	54 (39.4)	72 (56.7)	55 (43.3)
Missing	1,627 (80.9)	384 (19.1)	704 (75.6)	227 (24.4)
<b>Heart failure or pulmonary oedema, n (%)</b>				
No	62,729 (82.4)	13,433 (17.6)	23,032 (72.6)	8,696 (27.4)
Yes	6,421 (72.2)	2,473 (27.8)	3,079 (66.2)	1,570 (33.8)
<b>Chronic obstructive pulmonary diseases, n (%)</b>				
No	58,883 (82.1)	12,860 (17.9)	22,729 (72.0)	8,829 (28.0)
Yes	10,267 (77.1)	3,046 (22.9)	3,382 (70.2)	1,437 (29.8)
<b>Ischemic heart disease (acute), n (%)</b>				
No	62,842 (81.8)	13,985 (18.2)	23,407 (72.0)	9,101 (28.0)
Yes	6,308 (76.7)	1,921 (23.3)	2,704 (69.9)	1,165 (30.1)
<b>Cardiac dysrhythmias, n (%)</b>				
No	55,068 (82.5)	11,674 (17.5)	19,450 (72.6)	7,337 (27.4)
Yes	14,082 (76.9)	4,232 (23.1)	6,661 (69.5)	2,929 (30.5)
<b>Ischemic heart disease (chronic), n (%)</b>				
No	58,185 (82.1)	12,668 (17.9)	21,335 (72.3)	8,163 (27.7)
Yes	10,965 (77.2)	3,238 (22.8)	4,776 (69.4)	2,103 (30.6)

<b>Hypertension, n (%)</b>				
No	29,657 (81.4)	67,66 (18.6)	11,724 (70.7)	4,860 (29.3)
Yes	39,493 (81.2)	9,140 (18.8)	14,387 (72.7)	5,406 (27.3)
<b>Hypotension, n (%)</b>				
No	64,255 (81.9)	14,232 (18.1)	23,325 (72.4)	8,883 (27.6)
Yes	4,895 (74.5)	1,674 (25.5)	2,786 (66.8)	1,383 (33.2)
<b>Diabetes with complication, n (%)</b>				
No	68,200 (81.4)	15,600 (18.6)	25,771 (71.8)	10,114 (28.2)
Yes	950 (75.6)	306 (24.4)	340 (69.1)	152 (30.9)
<b>Depression, n (%)</b>				
No	64,293 (81.4)	14,709 (18.6)	23,253 (71.9)	9,101 (28.1)
Yes	4,857 (80.2)	1,197 (19.8)	2,858 (71.0)	1,165 (29.0)
<b>Delirium, n (%)</b>				
No	69,150 (81.3)	15,906 (18.7)	18,670 (71.9)	7,309 (28.1)
Yes	0	0	7,441 (71.6)	2,957 (28.4)

ASA, American Society of Anesthesiologists; IQR, interquartile range.

**Table ii.** Characteristics of patients surgically treated for non-pathological first hip fracture by timing of mobilisation across subgroup defined by ambulation in the complete case analysis dataset of day 30 recovery outcome (n = 33,273).

Variable	Outdoor (n = 24,492)		Indoor (n = 87,81)	
	Early mobilization (n = 20,820)	Late mobilization (n = 3,672)	Early mobilization (n = 6,517)	Late mobilization (n = 2,264)
Median age, yrs (IQR)	83 (76 to 88)	84 (78 to 88)	86 (81 to 91)	87 (81 to 91)
<b>Sex, n (%)</b>				
Female	15,136 (85.4)	2,594 (14.6)	5,035 (74.8)	1,692 (25.2)
Male	5,684 (84.1)	1,077 (15.9)	1,482 (72.2)	572 (27.8)
Missing	0 (0.0)	1 (100.0)		
<b>Ethnicity, n (%)</b>				
White	14,861 (86.6)	2,306 (13.4)	4,911 (76.4)	1,521 (23.6)
Caribbean or African (Black or Black British) or any mixed black background	14 (73.7)	5 (26.3)	9 (56.2)	7 (43.8)
Asian or Asian British or any mixed Asian background	141 (83.9)	27 (16.1)	47 (73.4)	17 (26.6)
Missing	5,804 (81.3)	1,334 (18.7)	1,550 (68.3)	719 (31.7)
<b>Deprivation, n (%)</b>				
Least deprived 10%	1,297 (84.7)	234 (15.3)	515 (74.4)	177 (25.6)
Less deprived 10-20%	1,354 (82.8)	282 (17.2)	504 (72.6)	190 (27.4)
Less deprived 20-30%	1,492 (84.4)	276 (15.6)	564 (75.5)	183 (24.5)
Less deprived 30-40%	1,780 (85.2)	308 (14.8)	602 (74.1)	210 (25.9)
Less deprived 40-50%	1,875 (84.0)	357 (16.0)	605 (75.2)	199 (24.8)
More deprived 40-50%	1,882 (82.3)	406 (17.7)	631 (70.9)	259 (29.1)
More deprived 30-40%	1,998 (85.3)	344 (14.7)	610 (72.4)	232 (27.6)
More deprived 20-30%	1,947 (85.7)	324 (14.3)	576 (75.2)	190 (24.8)
More deprived 10-20%	1,961 (84.6)	356 (15.4)	623 (79.3)	163 (20.7)
Most deprived 10%	2,114 (87.2)	309 (12.8)	486 (73.6)	174 (26.4)
Missing	3,120 (86.8)	476 (13.2)	801 (73.6)	287 (26.4)
<b>Hip fracture type, n (%)</b>				

Variable	Outdoor (n = 24,492)		Indoor (n = 87,81)	
	Early mobilization (n = 20,820)	Late mobilization (n = 3,672)	Early mobilization (n = 6,517)	Late mobilization (n = 2,264)
Intracapsular	12,738 (85.5)	2,162 (14.5)	3,599 (74.5)	1,235 (25.5)
Intertrochanteric	6,770 (84.7)	1,225 (15.3)	2,532 (75.0)	846 (25.0)
Subtrochanteric	1,312 (82.2)	285 (17.8)	386 (67.8)	183 (32.2)
<b>Indicator of surgery within target time of 36 hours, n (%)</b>				
Within target time	15,227 (86.0)	2,476 (14.0)	4,889 (75.8)	1,558 (24.2)
Not within target time	4,082 (83.1)	831 (16.9)	1,242 (69.0)	557 (31.0)
Missing	1511 (80.5)	365 (19.5)	386 (72.1)	149 (27.9)
<b>Type of procedure, n (%)</b>				
Internal fixation	10,007 (85.1)	1,753 (14.9)	3,291 (74.4)	1,135 (25.6)
Hemiarthroplasty	8,422 (83.7)	1,641 (16.3)	3,147 (74.0)	1,106 (26.0)
Total hip arthroplasty	2,293 (90.4)	243 (9.6)	52 (82.5)	11 (17.5)
Missing/other	98 (73.7)	35 (26.3)	27 (69.2)	12 (30.8)
<b>Calendar year of surgery, n (%)</b>				
2014	7,715 (84.2)	1,452 (15.8)	2,509 (72.8)	936 (27.2)
2015	13,099 (85.5)	2,217 (14.5)	4,006 (75.1)	1,327 (24.9)
2016	6 (66.7)	3 (33.3)	2 (66.7)	1 (33.3)
<b>Weekday of admission, n (%)</b>				
Weekday (Monday to Friday)	13,875 (85.0)	2,447 (15.0)	4,353 (74.3)	1,506 (25.7)
Weekend (Saturday to Sunday)	6,319 (86.0)	1,031 (14.0)	1,980 (75.3)	650 (24.7)
Missing	626 (76.3)	194 (23.7)	184 (63.0)	108 (37.0)
<b>Hospital volume, n (%)</b>				
High volume	10,031 (83.7)	1,951 (16.3)	3,137 (72.2)	1,210 (27.8)
Medium volume	6,269 (87.7)	877 (12.3)	1,990 (76.8)	600 (23.2)
Low volume	4,520 (84.3)	844 (15.7)	1,390 (75.4)	454 (24.6)
<b>ASA grade, n (%)</b>				
Normal healthy individual	714 (93.6)	49 (6.4)	22 (68.8)	10 (31.2)

Variable	Outdoor (n = 24,492)		Indoor (n = 87,81)	
	Early mobilization (n = 20,820)	Late mobilization (n = 3,672)	Early mobilization (n = 6,517)	Late mobilization (n = 2,264)
Mild systemic disease that does not limit activity	7,421 (88.6)	956 (11.4)	918 (79.5)	237 (20.5)
Severe systemic disease that limits activity but is not incapacitating	10,676 (83.6)	2,098 (16.4)	4,285 (75.1)	1,420 (24.9)
Incapacitating systemic disease which is constantly life-threatening	1,701 (77.7)	487 (22.3)	1,196 (68.3)	555 (31.7)
Moribund - not expected to survive 24 hours with or without surgery	23 (59.0)	16 (41.0)	20 (64.5)	11 (35.5)
Missing	285 (81.2)	66 (18.8)	76 (71.0)	31 (29.0)
<b>Heart failure or pulmonary oedema, n (%)</b>				
No	16,364 (85.3)	2,816 (14.7)	5,032 (74.8)	16,92 (25.2)
Yes	1,498 (78.1)	421 (21.9)	746 (70.7)	309 (29.3)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Chronic obstructive pulmonary diseases, n (%)</b>				
No	15,450 (85.0)	2,722 (15.0)	4,851 (74.0)	1,704 (26.0)
Yes	2,412 (82.4)	515 (17.6)	927 (75.7)	297 (24.3)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Ischemic heart disease (acute), n (%)</b>				
No	16,233 (85.0)	2,867 (15.0)	5,121 (74.3)	1,769 (25.7)
Yes	1,629 (81.5)	370 (18.5)	657 (73.9)	232 (26.1)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Cardiac dysrhythmias, n (%)</b>				
No	14,243 (85.6)	2,399 (14.4)	4,301 (74.8)	1,446 (25.2)
Yes	3,619 (81.2)	838 (18.8)	1477 (72.7)	555 (27.3)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Ischemic heart disease (chronic), n (%)</b>				
No	15,124 (85.2)	2,619 (14.8)	4,660 (74.5)	1,593 (25.5)



Variable	Outdoor (n = 24,492)		Indoor (n = 87,81)	
	Early mobilization (n = 20,820)	Late mobilization (n = 3,672)	Early mobilization (n = 6,517)	Late mobilization (n = 2,264)
Yes	2,738 (81.6)	618 (18.4)	1,118 (73.3)	408 (26.7)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Hypertension, n (%)</b>				
No	7,800 (84.6)	1,415 (15.4)	2,536 (73.5)	916 (26.5)
Yes	10,062 (84.7)	1,822 (15.3)	3,242 (74.9)	1,085 (25.1)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Hypotension, n (%)</b>				
No	16,664 (85.1)	2,928 (14.9)	5,212 (74.7)	1,763 (25.3)
Yes	1,198 (79.5)	309 (20.5)	566 (70.4)	238 (29.6)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Diabetes with complication, n (%)</b>				
No	17,640 (84.7)	3,182 (15.3)	5,699 (74.4)	1,962 (25.6)
Yes	222 (80.1)	55 (19.9)	79 (66.9)	39 (33.1)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Alzheimer's or dementia, n (%)</b>				
No	14,386 (85.8)	2,375 (14.2)	2,873 (75.7)	924 (24.3)
Yes	3,476 (80.1)	862 (19.9)	2,905 (73.0)	1,077 (27.0)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Depression, n (%)</b>				
No	16,589 (84.7)	3,006 (15.3)	5,217 (74.6)	1,780 (25.4)
Yes	1,273 (84.6)	231 (15.4)	561 (71.7)	221 (28.3)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Delirium, n (%)</b>				
No	16,815 (85.0)	2,978 (15.0)	5,088 (74.7)	1,726 (25.3)
Yes	1,047 (80.2)	259 (19.8)	690 (71.5)	275 (28.5)
Missing	2,958 (87.2)	435 (12.8)	739 (73.8)	263 (26.2)
<b>Location prior to hospitalization, n (%)</b>				
Own home/sheltered housing	18,430 (85.9)	3,028 (14.1)	3,699 (75.9)	1,174 (24.1)

Variable	Outdoor (n = 24,492)		Indoor (n = 87,81)	
	Early mobilization (n = 20,820)	Late mobilization (n = 3,672)	Early mobilization (n = 6,517)	Late mobilization (n = 2,264)
Nursing care/residential care	1,858 (79.6)	476 (20.4)	2,485 (73.1)	916 (26.9)
Missing	532 (76.0)	168 (24.0)	333 (65.7)	174 (34.3)

ASA, American Society of Anesthesiologists; IQR, interquartile range.

**Table iii.** Characteristics of patients surgically treated for non-pathological first hip fracture by timing of mobilisation across subgroup defined by dementia and ambulation prefracture in the complete case analysis dataset of day 30 recovery outcome (n = 28,878).

Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization n (n = 14,386)	Late mobilization n (n = 2,375)	Early mobilization n (n = 2,873)	Late mobilization n (n = 924)	Early mobilization n (n = 3,476)	Late mobilization n (n = 862)	Early mobilization n (n = 2,905)	Late mobilization n (n = 1,077)
Median age, yrs (IQR)	82 (75 to 87)	83 (77 to 88)	86 (79 to 91)	86 (80 to 91)	85 (81 to 90)	86 (81 to 90)	87 (83 to 91)	87 (82 to 91)
<b>Sex, n (%)</b>								
Female	10,393 (86.0)	1,690 (14.0)	2,183 (76.0)	690 (24.0)	2,570 (81.0)	604 (19.0)	2,283 (74.1)	799 (25.9)
Male	3,993 (85.4)	685 (14.6)	690 (74.7)	234 (25.3)	906 (77.9)	257 (22.1)	622 (69.1)	278 (30.9)
Missing					0 (0.0)	1 (100.0)		
<b>Ethnicity, n (%)</b>								
White	11,924 (87.8)	1,663 (12.2)	2,432 (78.3)	674 (21.7)	2,937 (82.0)	643 (18.0)	2,479 (74.5)	847 (25.5)
Caribbean or African (Black or Black British) or any mixed black background	12 (75.0)	4 (25.0)	3 (75.0)	1 (25.0)	2 (66.7)	1 (33.3)	6 (50.0)	6 (50.0)
Asian or Asian British or any mixed Asian background	117 (85.4)	20 (14.6)	30 (75.0)	10 (25.0)	24 (77.4)	7 (22.6)	17 (70.8)	7 (29.2)
Missing	2,333 (77.2)	688 (22.8)	408 (63.1)	239 (36.9)	513 (70.9)	211 (29.1)	403 (65.0)	217 (35.0)

Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization (n = 14,386)	Late mobilization (n = 2,375)	Early mobilization (n = 2,873)	Late mobilization (n = 924)	Early mobilization (n = 3,476)	Late mobilization (n = 862)	Early mobilization (n = 2,905)	Late mobilization (n = 1,077)
<b>Deprivation, n (%)</b>								
Least deprived 10%	1,046 (86.2)	167 (13.8)	294 (78.0)	83 (22.0)	251 (78.9)	67 (21.1)	221 (70.2)	94 (29.8)
Less deprived 10-20%	1,060 (83.3)	213 (16.7)	267 (74.8)	90 (25.2)	294 (81.0)	69 (19.0)	237 (70.3)	100 (29.7)
Less deprived 20-30%	1,154 (85.8)	191 (14.2)	281 (77.2)	83 (22.8)	338 (79.9)	85 (20.1)	283 (73.9)	100 (26.1)
Less deprived 30-40%	1,414 (86.3)	225 (13.7)	278 (73.4)	101 (26.6)	366 (81.5)	83 (18.5)	324 (74.8)	109 (25.2)
Less deprived 40-50%	1,524 (85.2)	264 (14.8)	292 (76.8)	88 (23.2)	351 (79.1)	93 (20.9)	313 (73.8)	111 (26.2)
More deprived 40-50%	1,519 (83.4)	302 (16.6)	313 (74.0)	110 (26.0)	363 (77.7)	104 (22.3)	318 (68.1)	149 (31.9)
More deprived 30-40%	1,604 (86.2)	256 (13.8)	319 (76.1)	100 (23.9)	394 (81.7)	88 (18.3)	291 (68.8)	132 (31.2)
More deprived 20-30%	1,631 (87.2)	240 (12.8)	245 (71.6)	97 (28.4)	316 (79.0)	84 (21.0)	331 (78.1)	93 (21.9)
More deprived 10-20%	1,590 (85.9)	260 (14.1)	306 (78.7)	83 (21.3)	371 (79.4)	96 (20.6)	317 (79.8)	80 (20.2)
Most deprived 10%	1,712 (88.1)	232 (11.9)	240 (76.7)	73 (23.3)	402 (83.9)	77 (16.1)	246 (70.9)	101 (29.1)
Missing	132 (84.1)	25 (15.9)	38 (70.4)	16 (29.6)	30 (65.2)	16 (34.8)	24 (75.0)	8 (25.0)
<b>Hip fracture type, n (%)</b>								

Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization (n = 14,386)	Late mobilization (n = 2,375)	Early mobilization (n = 2,873)	Late mobilization (n = 924)	Early mobilization (n = 3,476)	Late mobilization (n = 862)	Early mobilization (n = 2,905)	Late mobilization (n = 1,077)
Intracapsular	8,879 (86.4)	1,398 (13.6)	1,579 (75.8)	505 (24.2)	2,049 (79.3)	536 (20.7)	1,609 (72.9)	598 (27.1)
Intertrochanteric	4,584 (85.4)	782 (14.6)	1,099 (77.3)	322 (22.7)	1,234 (81.2)	286 (18.8)	1,155 (73.7)	413 (26.3)
Subtrochanteric	923 (82.6)	195 (17.4)	195 (66.8)	97 (33.2)	193 (82.8)	40 (17.2)	141 (68.1)	66 (31.9)
<b>Indicator of surgery within target time of 36 hours, n (%)</b>								
Within target time	10,484 (86.8)	1,592 (13.2)	2,164 (77.6)	623 (22.4)	2,621 (81.5)	593 (18.5)	2,195 (74.3)	759 (25.7)
Not within target time	2,840 (84.1)	535 (15.9)	539 (68.9)	243 (31.1)	623 (76.8)	188 (23.2)	531 (68.4)	245 (31.6)
Missing	1,062 (81.1)	248 (18.9)	170 (74.6)	58 (25.4)	232 (74.1)	81 (25.9)	179 (71.0)	73 (29.0)
<b>Type of procedure, n (%)</b>								
Internal fixation	6,933 (85.9)	1,139 (14.1)	1,447 (76.2)	452 (23.8)	1,679 (81.5)	381 (18.5)	1,473 (73.2)	540 (26.8)
Hemiarthroplasty	5,519 (84.5)	1,011 (15.5)	1,373 (74.9)	460 (25.1)	1,728 (78.8)	465 (21.2)	1,413 (72.8)	528 (27.2)
Total hip arthroplasty	1,881 (90.2)	204 (9.8)	36 (87.8)	5 (12.2)	53 (88.3)	7 (11.7)	10 (66.7)	5 (33.3)
Missing/other	53 (71.6)	21 (28.4)	17 (70.8)	7 (29.2)	16 (64.0)	9 (36.0)	9 (69.2)	4 (30.8)
<b>Location prior to</b>								

Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization (n = 14,386)	Late mobilization (n = 2,375)	Early mobilization (n = 2,873)	Late mobilization (n = 924)	Early mobilization (n = 3,476)	Late mobilization (n = 862)	Early mobilization (n = 2,905)	Late mobilization (n = 1,077)
<b>hospitalization, n (%)</b>								
Own home/sheltered housing	13,616 (86.2)	2,179 (13.8)	2,233 (76.5)	687 (23.5)	2,128 (81.5)	483 (18.5)	1,018 (74.7)	344 (25.3)
Nursing care/residential care	448 (79.7)	114 (20.3)	499 (73.3)	182 (26.7)	1,174 (78.8)	316 (21.2)	1,718 (73.0)	636 (27.0)
Missing	322 (79.7)	82 (20.3)	141 (71.9)	55 (28.1)	174 (73.4)	63 (26.6)	169 (63.5)	97 (36.5)
<b>Calendar year of surgery, n (%)</b>								
2014	6,272 (85.5)	1,067 (14.5)	1,258 (73.8)	447 (26.2)	1,443 (78.9)	385 (21.1)	1,251 (71.9)	489 (28.1)
2015	8,111 (86.1)	1,306 (13.9)	1,613 (77.2)	476 (22.8)	2,030 (81.0)	476 (19.0)	1,654 (73.8)	588 (26.2)
2016	3 (60.0)	2 (40.0)	2 (66.7)	1 (33.3)	3 (75.0)	1 (25.0)	0	0
<b>Weekday of admission, n (%)</b>								
Weekday (Monday to Friday)	9,700 (85.7)	1,625 (14.3)	1,942 (75.9)	617 (24.1)	2,295 (80.4)	560 (19.6)	1,939 (73.2)	711 (26.8)
Weekend (Saturday to Sunday)	4,231 (87.0)	631 (13.0)	844 (76.4)	260 (23.6)	1,094 (81.4)	250 (18.6)	890 (73.9)	315 (26.1)
Missing	455 (79.3)	119 (20.7)	87 (64.9)	47 (35.1)	87 (62.6)	52 (37.4)	76 (59.8)	51 (40.2)

Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization (n = 14,386)	Late mobilization (n = 2,375)	Early mobilization (n = 2,873)	Late mobilization (n = 924)	Early mobilization (n = 3,476)	Late mobilization (n = 862)	Early mobilization (n = 2,905)	Late mobilization (n = 1,077)
<b>Hospital volume, n (%)</b>								
High volume	6,852 (84.6)	1,250 (15.4)	1,418 (74.2)	494 (25.8)	1,711 (78.8)	460 (21.2)	1,372 (70.4)	578 (29.6)
Medium volume	4,030 (88.1)	546 (11.9)	759 (78.2)	212 (21.8)	953 (85.1)	167 (14.9)	875 (76.0)	277 (24.0)
Low volume	3,504 (85.8)	579 (14.2)	696 (76.1)	218 (23.9)	812 (77.6)	235 (22.4)	658 (74.8)	222 (25.2)
<b>ASA grade, n (%)</b>								
Normal healthy individual	565 (93.1)	42 (6.9)	13 (65.0)	7 (35.0)	20 (95.2)	1 (4.8)	5 (71.4)	2 (28.6)
Mild systemic disease that does not limit activity	5,662 (88.9)	705 (11.1)	506 (81.7)	113 (18.3)	635 (82.7)	133 (17.3)	288 (75.4)	94 (24.6)
Severe systemic disease that limits activity but is not incapacitating	6,977 (84.3)	1,296 (15.7)	1,820 (75.6)	589 (24.4)	2,248 (80.3)	551 (19.7)	1,963 (74.8)	661 (25.2)
Incapacitating systemic disease which is constantly life-threatening	994 (78.0)	281 (22.0)	495 (71.2)	200 (28.8)	515 (76.4)	159 (23.6)	598 (66.6)	300 (33.4)

Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization (n = 14,386)	Late mobilization (n = 2,375)	Early mobilization (n = 2,873)	Late mobilization (n = 924)	Early mobilization (n = 3,476)	Late mobilization (n = 862)	Early mobilization (n = 2,905)	Late mobilization (n = 1,077)
Moribund - not expected to survive 24 hours with or without surgery	11 (61.1)	7 (38.9)	8 (66.7)	4 (33.3)	7 (63.6)	4 (36.4)	11 (64.7)	6 (35.3)
Missing	177 (80.1)	44 (19.9)	31 (73.8)	11 (26.2)	51 (78.5)	14 (21.5)	40 (74.1)	14 (25.9)
<b>Heart failure or pulmonary oedema, n (%)</b>								
No	13,251 (86.5)	2,072 (13.5)	2,461 (76.0)	778 (24.0)	3,113 (80.7)	744 (19.3)	2,571 (73.8)	914 (26.2)
Yes	1,135 (78.9)	303 (21.1)	412 (73.8)	146 (26.2)	363 (75.5)	118 (24.5)	334 (67.2)	163 (32.8)
<b>Chronic obstructive pulmonary diseases, n (%)</b>								
No	12,406 (86.3)	1,971 (13.7)	2,319 (75.3)	759 (24.7)	3,044 (80.2)	751 (19.8)	2,532 (72.8)	945 (27.2)
Yes	1,980 (83.1)	404 (16.9)	554 (77.1)	165 (22.9)	432 (79.6)	111 (20.4)	373 (73.9)	132 (26.1)
<b>Ischemic heart disease (acute), n (%)</b>								
No	13,091 (86.1)	2,112 (13.9)	2,508 (75.7)	804 (24.3)	3,142 (80.6)	755 (19.4)	2,613 (73.0)	965 (27.0)
Yes	1,295 (83.1)	263 (16.9)	365 (75.3)	120 (24.7)	334 (75.7)	107 (24.3)	292 (72.3)	112 (27.7)



Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization (n = 14,386)	Late mobilization (n = 2,375)	Early mobilization (n = 2,873)	Late mobilization (n = 924)	Early mobilization (n = 3,476)	Late mobilization (n = 862)	Early mobilization (n = 2,905)	Late mobilization (n = 1,077)
<b>Cardiac dysrhythmias, n (%)</b>								
No	11,601 (86.8)	1,765 (13.2)	2,141 (75.9)	678 (24.1)	2,642 (80.6)	634 (19.4)	2,160 (73.8)	768 (26.2)
Yes	2,785 (82.0)	610 (18.0)	732 (74.8)	246 (25.2)	834 (78.5)	228 (21.5)	745 (70.7)	309 (29.3)
<b>Ischemic heart disease (chronic), n (%)</b>								
No	12,231 (86.4)	1,925 (13.6)	2,295 (75.7)	735 (24.3)	2,893 (80.7)	694 (19.3)	2365 (73.4)	858 (26.6)
Yes	2,155 (82.7)	450 (17.3)	578 (75.4)	189 (24.6)	583 (77.6)	168 (22.4)	540 (71.1)	219 (28.9)
<b>Hypertension, n (%)</b>								
No	6,229 (86.4)	982 (13.6)	1,209 (75.4)	395 (24.6)	1,571 (78.4)	433 (21.6)	1,327 (71.8)	521 (28.2)
Yes	8,157 (85.4)	1,393 (14.6)	1,664 (75.9)	529 (24.1)	1,905 (81.6)	429 (18.4)	1,578 (73.9)	556 (26.1)
<b>Hypotension, n (%)</b>								
No	13,520 (86.2)	2,166 (13.8)	2,613 (76.0)	824 (24.0)	3,144 (80.5)	762 (19.5)	2,599 (73.5)	939 (26.5)
Yes	866 (80.6)	209 (19.4)	260 (72.2)	100 (27.8)	332 (76.9)	100 (23.1)	306 (68.9)	138 (31.1)
<b>Diabetes with complication, n (%)</b>								

Variable	Without dementia				With dementia			
	Outdoor(n = 16,761)		Indoor (n = 3,797)		Outdoor (n = 4,338)		Indoor (n = 3,982)	
	Early mobilization (n = 14,386)	Late mobilization (n = 2,375)	Early mobilization (n = 2,873)	Late mobilization (n = 924)	Early mobilization (n = 3,476)	Late mobilization (n = 862)	Early mobilization (n = 2,905)	Late mobilization (n = 1,077)
No	14,210 (85.9)	2,331 (14.1)	2,824 (75.8)	903 (24.2)	3,430 (80.1)	851 (19.9)	2,875 (73.1)	1,059 (26.9)
Yes	176 (80.0)	44 (20.0)	49 (70.0)	21 (30.0)	46 (80.7)	11 (19.3)	30 (62.5)	18 (37.5)
<b>Depression, n (%)</b>								
No	13,504 (85.9)	2,223 (14.1)	2,628 (75.9)	835 (24.1)	3,085 (79.8)	783 (20.2)	2,589 (73.3)	945 (26.7)
Yes	882 (85.3)	152 (14.7)	245 (73.4)	89 (26.6)	391 (83.2)	79 (16.8)	316 (70.5)	132 (29.5)
<b>Delirium, n (%)</b>								
No	14,386 (85.8)	2,375 (14.2)	2,873 (75.7)	924 (24.3)	2,429 (80.1)	603 (19.9)	2,215 (73.4)	802 (26.6)
Yes	0	0	0	0	1047 (80.2)	259 (19.8)	690 (71.5)	275 (28.5)

ASA, American Society of Anesthesiologists; IQR, interquartile range.

**Table iv.** Characteristics of patients surgically treated for non-pathological first hip fracture for all patients, those included and excluded from the complete case analysis for survival at 30-days.

<b>Variable</b>	<b>All (n = 170,937)</b>	<b>Complete case (n = 126,897)</b>	<b>Excluded (n = 44,040)</b>
Median age, yrs (IQR)	84 (77 to 89)	84 (77 to 89)	84 (77 to 89)
<b>Sex, n (%)</b>			
Female	124,678 (72.9)	91,962 (72.5)	32,716 (74.3)
Male	46,255 (27.1)	34,933 (27.5)	11,322 (25.7)
Missing	4 (0.0)	2 (0.0)	2 (0.0)
<b>Ethnicity, n (%)</b>			
White	109,886 (64.3)	99,585 (78.5)	10,301 (23.4)
Caribbean or African (Black or Black British) or any mixed black background	267 (0.2)	244 (0.2)	23 (0.1)
Asian or Asian British or any mixed Asian background	1409 (0.8)	1262 (1.0)	147 (0.3)
Missing	59,375 (34.7)	25,806 (20.3)	33,569 (76.2)
<b>Deprivation, n (%)</b>			
Least deprived 10%	11,687 (6.8)	10,545 (8.3)	1,142 (2.6)
Less deprived 10-20%	11,452 (6.7)	10,335 (8.1)	1,117 (2.5)
Less deprived 20-30%	12,468 (7.3)	11,254 (8.9)	1,214 (2.8)
Less deprived 30-40%	13,216 (7.7)	12,023 (9.5)	1,193 (2.7)
Less deprived 40-50%	13,880 (8.1)	12,618 (9.9)	1,262 (2.9)
More deprived 40-50%	14,711 (8.6)	13,315 (10.5)	1,396 (3.2)
More deprived 30-40%	14,551 (8.5)	13,149 (10.4)	1,402 (3.2)
More deprived 20-30%	14,029 (8.2)	12,701 (10.0)	1,328 (3.0)
More deprived 10-20%	13,902 (8.1)	12,622 (9.9)	1,280 (2.9)
Most deprived 10%	13,114 (7.7)	11,910 (9.4)	1,204 (2.7)
Missing	37,927 (22.2)	6,425 (5.1)	31,502 (71.5)
<b>Prefracture ambulation, n (%)</b>			

<b>Variable</b>	<b>All (n = 170,937)</b>	<b>Complete case (n = 126,897)</b>	<b>Excluded (n = 44,040)</b>
Outdoor ambulation	122,434 (71.6)	94,137 (74.2)	28,297 (64.3)
indoor ambulation	42,279 (24.7)	29,567 (23.3)	1,2712 (28.9)
No functional ambulation	2,382 (1.4)	1,717 (1.4)	665 (1.5)
Missing	3,842 (2.2)	1,476 (1.2)	2,366 (5.4)
<b>Hip fracture type, n (%)</b>			
Intracapsular	100,850 (59.0)	74,886 (59.0)	25,964 (59.0)
Intertrochanteric	59,591 (34.9)	44,463 (35.0)	15,128 (34.4)
Subtrochanteric	10,086 (5.9)	7,488 (5.9)	2,598 (5.9)
Missing	410 (0.2)	60 (0.0)	350 (0.8)
<b>Indicator of surgery within target time of 36 hours, n (%)</b>			
Within target time	108,660 (63.6)	90,713 (71.5)	17,947 (40.8)
Not within target time	38,212 (22.4)	28,101 (22.1)	10,111 (23.0)
Missing	24,065 (14.1)	8,083 (6.4)	15,982 (36.3)
<b>Type of procedure, n (%)</b>			
Internal fixation	83,326 (48.7)	61,888 (48.8)	21,438 (48.7)
Hemiarthroplasty	73,824 (43.2)	54,942 (43.3)	18,882 (42.9)
Total Hip replacement	12,895 (7.5)	9,514 (7.5)	3,381 (7.7)
Missing/Other	892 (0.5)	553 (0.4)	339 (0.8)
<b>Location prior to hospitalization, n (%)</b>			
Own home/sheltered housing	136,463 (79.8)	100,760 (79.4)	35,703 (81.1)
Nursing care/residential care	30,287 (17.7)	23,127 (18.2)	7,160 (16.3)
Missing	4,187 (2.4)	3,010 (2.4)	1,177 (2.7)
<b>Calendar year of surgery, n (%)</b>			
2014	45,039 (26.3)	33,361 (26.3)	11,678 (26.5)
2015	74,544 (43.6)	50,875 (40.1)	23,669 (53.7)
2016	51,354 (30.0)	42,661 (33.6)	8,693 (19.7)
Weekday of admission, n (%)			

Variable	All (n = 170,937)	Complete case (n = 126,897)	Excluded (n = 44,040)
Weekday (Monday to Friday)	111,942 (65.5)	84,563 (66.6)	27,379 (62.2)
Weekend (Saturday to Sunday)	5,2513 (30.7)	37,966 (29.9)	14,547 (33.0)
Missing	6,482 (3.8)	4,368 (3.4)	2,114 (4.8)
<b>Hospital volume, n (%)</b>			
High volume	85,853 (50.2)	65,307 (51.5)	20,546 (46.7)
Medium volume	42,472 (24.8)	29,171 (23.0)	13,301 (30.2)
Low volume	42,612 (24.9)	32,419 (25.5)	10,193 (23.1)
<b>Mobilization after surgery within target time of day of/day after, n (%)</b>			
Within target time	111,159 (65.0)	99,667 (78.5)	11,492 (26.1)
After target time	29,993 (17.5)	27,230 (21.5)	2,763 (6.3)
Missing	29,785 (17.4)	0 (0.0)	29,785 (67.6)
<b>ASA grade, n (%)</b>			
Normal healthy individual	4,037 (2.4)	2,814 (2.2)	1,223 (2.8)
Mild systemic disease that does not limit activity	47,601 (27.8)	33,975 (26.8)	13,626 (30.9)
Severe systemic disease that limits activity but is not incapacitating	93,395 (54.6)	70,338 (55.4)	23,057 (52.4)
Incapacitating systemic disease which is constantly life-threatening	20,710 (12.1)	16,440 (13.0)	4,270 (9.7)
Moribund - not expected to survive 24 hours with or without surgery	371 (0.2)	284 (0.2)	87 (0.2)
Missing	4,823 (2.8)	3,046 (2.4)	1,777 (4.0)
<b>Heart failure or pulmonary oedema, n (%)</b>			
No	119,114 (69.7)	107,890 (85.0)	11,224 (25.5)
Yes	14,922 (8.7)	13,543 (10.7)	1,379 (3.1)
Missing	36,901 (21.6)	5,464 (4.3)	31,437 (71.4)
<b>Chronic obstructive pulmonary diseases, n (%)</b>			
No	114,173 (66.8)	103,301 (81.4)	10,872 (24.7)

Variable	All (n = 170,937)	Complete case (n = 126,897)	Excluded (n = 44,040)
Yes	19,863 (11.6)	18,132 (14.3)	1,731 (3.9)
<b>Ischemic heart disease (acute), n (%)</b>			
No	120,652 (70.6)	109,335 (86.2)	11,317 (25.7)
Yes	13,384 (7.8)	12,098 (9.5)	1,286 (2.9)
<b>Cardiac dysrhythmias, n (%)</b>			
No	10,3243 (60.4)	93,529 (73.7)	9,714 (22.1)
Yes	30,793 (18.0)	27,904 (22.0)	2,889 (6.6)
<b>Ischemic heart disease (chronic), n (%)</b>			
No	110876 (64.9)	100,351 (79.1)	10,525 (23.9)
Yes	23160 (13.5)	21,082 (16.6)	2,078 (4.7)
<b>Hypertension, n (%)</b>			
No	58,620 (34.3)	53,007 (41.8)	5,613 (12.7)
Yes	75,416 (44.1)	68,426 (53.9)	6,990 (15.9)
<b>Hypotension, n (%)</b>			
No	122,233 (71.5)	110,695 (87.2)	11,538 (26.2)
Yes	11,803 (6.9)	10,738 (8.5)	1,065 (2.4)
<b>Diabetes with complication, n (%)</b>			
No	132,115 (77.3)	119,685 (94.3)	12,430 (28.2)
Yes	1,921 (1.1)	1,748 (1.4)	173 (0.4)
<b>Alzheimer's or dementia, n (%)</b>			
No	93,937 (55.0)	85,056 (67.0)	8,881 (20.2)
Yes	40,099 (23.5)	36,377 (28.7)	3,722 (8.5)
<b>Depression, n (%)</b>			
No	122,942 (71.9)	111,356 (87.8)	11,586 (26.3)
Yes	11,094 (6.5)	10,077 (7.9)	1,017 (2.3)
<b>Delirium, n (%)</b>			
No	122,780 (71.8)	111,035 (87.5)	11,745 (26.7)
Yes	11256 (6.6)	10,398 (8.2)	858 (1.9)

**Table v.** Characteristics of patients surgically treated for non-pathological first hip fracture for all patients, those included and excluded from the complete cases analysis for recovery at 30 days.

<b>Variable</b>	<b>All (n = 170,937)</b>	<b>Complete case (n = 33,273)</b>	<b>Excluded (n = 137,664)</b>
Median age, yrs (IQR)	84 (77 to 89)	84 (77 to 89)	84 (77 to 89)
<b>Sex, n (%)</b>			
Female	124,678 (72.9)	24,788 (73.4)	99,890 (72.8)
Male	46,255 (27.1)	8,979 (26.6)	37,276 (27.2)
Missing	4 (0.0)	1 (0.0)	3 (0.0)
<b>Ethnicity, n (%)</b>			
White	109,886 (64.3)	23,945 (70.9)	85,941 (62.7)
Caribbean or African (Black or Black British) or any mixed black background	267 (0.2)	35 (0.1)	232 (0.2)
Asian or Asian British or any mixed Asian background	1,409 (0.8)	238 (0.7)	1,171 (0.9)
Missing	59,375 (34.7)	9,550 (28.3)	49,825 (36.3)
<b>Deprivation, n (%)</b>			
Least deprived 10%	11,687 (6.8)	2,270 (6.7)	9,417 (6.9)
Less deprived 10-20%	11,452 (6.7)	2,362 (7.0)	9,090 (6.6)
Less deprived 20-30%	12,468 (7.3)	2,568 (7.6)	9,900 (7.2)
Less deprived 30-40%	13,216 (7.7)	2,947 (8.7)	10,269 (7.5)
Less deprived 40-50%	13,880 (8.1)	3,077 (9.1)	10,803 (7.9)
More deprived 40-50%	14,711 (8.6)	3,234 (9.6)	11,477 (8.4)
More deprived 30-40%	14,551 (8.5)	3,223 (9.5)	11,328 (8.3)
More deprived 20-30%	14,029 (8.2)	3,081 (9.1)	10,948 (8.0)
More deprived 10-20%	13,902 (8.1)	3,146 (9.3)	10,756 (7.8)
Most deprived 10%	13,114 (7.7)	3,121 (9.2)	9,993 (7.3)
Missing	37,927 (22.2)	4,739 (14.0)	33,188 (24.2)
<b>Prefracture ambulation, n (%)</b>			
Outdoor ambulation	122,434 (71.6)	24,492 (72.5)	97,942 (71.4)
indoor ambulation	42,279 (24.7)	8,781 (26.0)	33,498 (24.4)
No functional ambulation	2,382 (1.4)	495 (1.5)	1,887 (1.4)

<b>Variable</b>	<b>All (n = 170,937)</b>	<b>Complete case (n = 33,273)</b>	<b>Excluded (n = 137,664)</b>
Missing	3,842 (2.2)	0 (0.0)	3,842 (2.8)
<b>Hip fracture type, n (%)</b>			
Intracapsular	100,850 (59.0)	19,993 (59.2)	80,857 (58.9)
Intertrochanteric	59,591 (34.9)	11,575 (34.3)	48,016 (35.0)
Subtrochanteric	10,086 (5.9)	2,200 (6.5)	7,886 (5.7)
Missing	410 (0.2)	0 (0.0)	410 (0.3)
<b>Indicator of surgery within target time of 36 hours, n (%)</b>			
Within target time	108,660 (63.6)	24,491 (72.5)	84,169 (61.4)
Not within target time	38,212 (22.4)	6,825 (20.2)	31,387 (22.9)
Missing	24,065 (14.1)	2,452 (7.3)	21,613 (15.8)
<b>Type of procedure, n (%)</b>			
fixation	83,326 (48.7)	16,460 (48.7)	66,866 (48.7)
implantation or other	86,719 (50.7)	17,127 (50.7)	69,592 (50.7)
Missing/Other	892 (0.5)	181 (0.5)	711 (0.5)
<b>Location prior to hospitalization, n (%)</b>			
Own home/sheltered housing	136,463 (79.8)	26,552 (78.6)	109,911 (80.1)
Nursing care/residential care	30,287 (17.7)	5,982 (17.7)	24,305 (17.7)
Missing	4,187 (2.4)	1,234 (3.7)	2,953 (2.2)
<b>Calendar year of surgery, n (%)</b>			
2014	45,039 (26.3)	12,797 (37.9)	32,242 (23.5)
2015	74,544 (43.6)	20,958 (62.1)	53,586 (39.1)
2016	51,354 (30.0)	13 (0.0)	51,341 (37.4)
<b>Weekday of admission, n (%)</b>			
Weekday (Monday-Friday)	111,942 (65.5)	22,532 (66.7)	89,410 (65.2)
Weekend (Saturday-Sunday)	52,513 (30.7)	10,106 (29.9)	42,407 (30.9)
Missing	6,482 (3.8)	1,130 (3.3)	5,352 (3.9)
<b>Hospital volume, n (%)</b>			
High volume	85,853 (50.2)	16,558 (49.0)	69,295 (50.5)
Medium volume	42,472 (24.8)	9,882 (29.3)	32,590 (23.8)



<b>Variable</b>	<b>All (n = 170,937)</b>	<b>Complete case (n = 33,273)</b>	<b>Excluded (n = 137,664)</b>
Low volume	42,612 (24.9)	7,328 (21.7)	35,284 (25.7)
<b>Mobilization after surgery within target time of day of/day after, n (%)</b>			
Within target time	111,159 (65.0)	27,655 (81.9)	83,504 (60.9)
After target time	29,993 (17.5)	6,113 (18.1)	23,880 (17.4)
Missing	29,785 (17.4)	0 (0.0)	29,785 (21.7)
<b>ASA grade, n (%)</b>			
Normal healthy individual	4,037 (2.4)	795 (2.4)	3,242 (2.4)
Mild systemic disease that does not limit activity	47,601 (27.8)	9,573 (28.3)	38,028 (27.7)
Severe systemic disease that limits activity but is not incapacitating	93,395 (54.6)	18,806 (55.7)	74,589 (54.4)
Incapacitating systemic disease which is constantly life-threatening	20,710 (12.1)	4,057 (12.0)	16,653 (12.1)
Moribund - not expected to survive 24 hours with or without surgery	371 (0.2)	73 (0.2)	298 (0.2)
Missing	4,823 (2.8)	464 (1.4)	4,359 (3.2)
<b>Heart failure or pulmonary oedema, n (%)</b>			
No	119,114 (69.7)	26,295 (77.9)	92,819 (67.7)
Yes	14,922 (8.7)	3,025 (9.0)	11,897 (8.7)
Missing	36,901 (21.6)	4,448 (13.2)	32,453 (23.7)
<b>Chronic obstructive pulmonary diseases, n (%)</b>			
No	114,173 (66.8)	25,103 (74.3)	89,070 (64.9)
Yes	19,863 (11.6)	4,217 (12.5)	15,646 (11.4)
<b>Ischemic heart disease (acute), n (%)</b>			
No	120,652 (70.6)	26,380 (78.1)	94,272 (68.7)
Yes	13,384 (7.8)	2,940 (8.7)	10,444 (7.6)
<b>Cardiac dysrhythmias, n (%)</b>			
No	103,243 (60.4)	22,729 (67.3)	80,514 (58.7)

<b>Variable</b>	<b>All (n = 170,937)</b>	<b>Complete case (n = 33,273)</b>	<b>Excluded (n = 137,664)</b>
Yes	30,793 (18.0)	6,591 (19.5)	24,202 (17.6)
<b>Ischemic heart disease (chronic), n (%)</b>			
No	110,876 (64.9)	24,359 (72.1)	86,517 (63.1)
Yes	23,160 (13.5)	4,961 (14.7)	18,199 (13.3)
<b>Hypertension, n (%)</b>			
No	58,620 (34.3)	12,884 (38.2)	45,736 (33.3)
Yes	75,416 (44.1)	16,436 (48.7)	58,980 (43.0)
<b>Hypotension, n (%)</b>			
No	122,233 (71.5)	26,966 (79.9)	95,267 (69.5)
Yes	11,803 (6.9)	2,354 (7.0)	9,449 (6.9)
<b>Diabetes with complication, n (%)</b>			
No	132,115 (77.3)	28,913 (85.6)	103,202 (75.2)
Yes	1,921 (1.1)	407 (1.2)	1,514 (1.1)
<b>Alzheimer's or dementia, n (%)</b>			
No	93,937 (55.0)	20,777 (61.5)	73,160 (53.3)
Yes	40,099 (23.5)	8,543 (25.3)	31,556 (23.0)
<b>Depression, n (%)</b>			
No	122,942 (71.9)	26,991 (79.9)	9,5951 (70.0)
Yes	11,094 (6.5)	2,329 (6.9)	8,765 (6.4)
<b>Delirium, n (%)</b>			
No	122,780 (71.8)	26,997 (79.9)	95,783 (69.8)
Yes	11,256 (6.6)	2,323 (6.9)	8,933 (6.5)

## Balance checks for propensity weighting

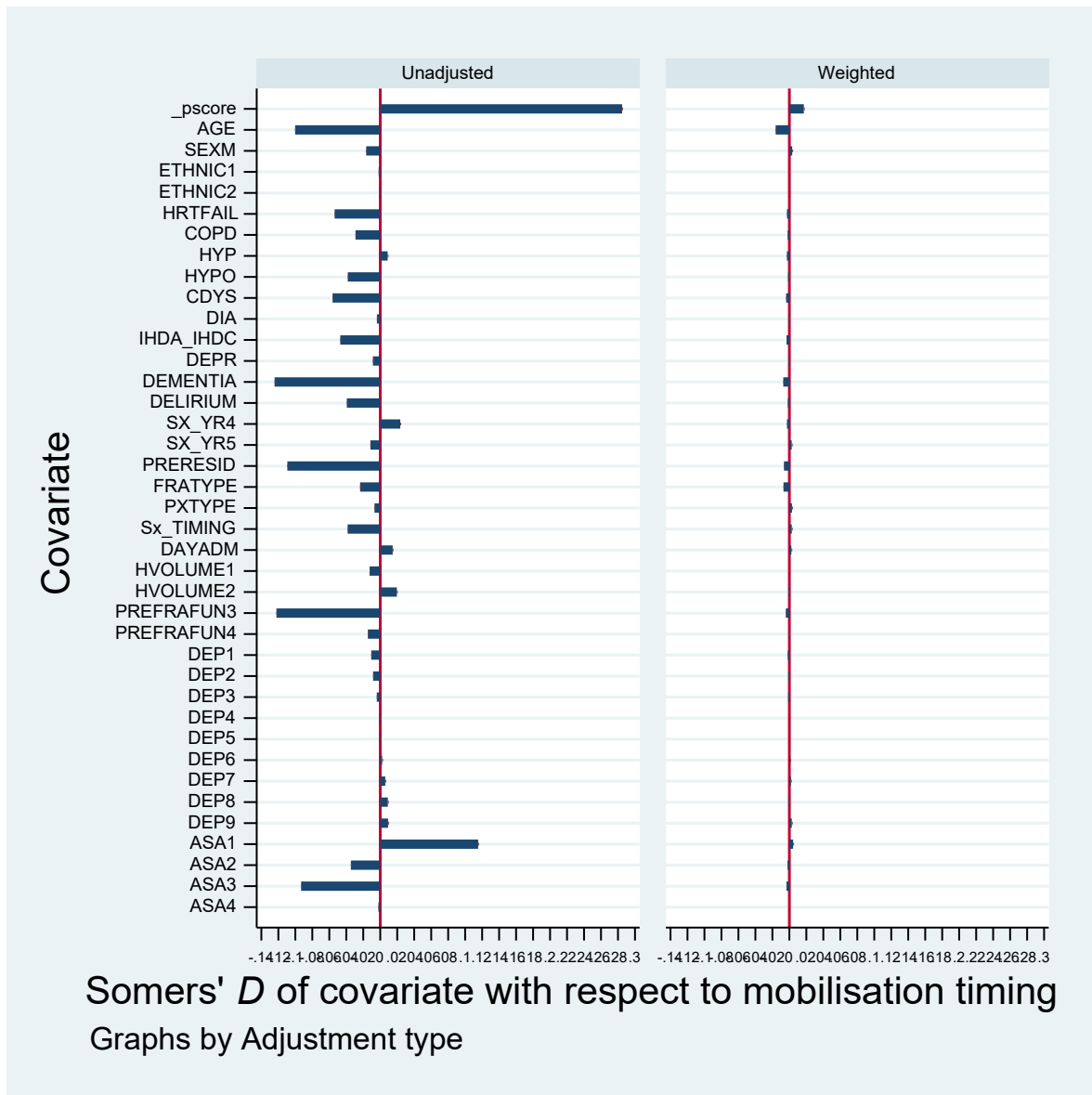
The propensity scores are the fitted probability of a patient being mobilised early. The confounders included in the models for the fitted probability of a patient being mobilised early:

1. Age was additively included as a continuous variable and sex as a categorical variable with levels 0 (baseline) for male and 1 for female.
2. Ethnicity. This was included as an additive categorical variable, with values 0 (baseline for White), 1 (Caribbean or African or any mixed Black background), 2 (Asian or Asian British) and 3 (any mixed Asian background),<sup>1</sup>
3. Deprivation (Index of Multiple Deprivation decile groups),<sup>2</sup>
4. Fracture type as an additive categorical variable with value 0 (baseline for intracapsular) and 1 (intertrochanteric/subtrochanteric),<sup>3</sup>
5. Each comorbidity was included as an additive categorical variable with 0 (baseline- Absent comorbidity) and 1 (present comorbidity). The comorbidities were: heart failure or pulmonary oedema,<sup>4</sup> chronic obstructive pulmonary disease,<sup>5</sup> ischaemic heart disease (acute or chronic),<sup>6</sup> cardiac dysrhythmias,<sup>7</sup> hypertension,<sup>8</sup> hypotension,<sup>9</sup> diabetes with complication,<sup>10</sup> Alzheimer's or dementia,<sup>11</sup> depression,<sup>12</sup> delirium,<sup>12</sup>
6. ASA grade. This was included as an additive categorical variable, with values 0 (baseline for normal healthy individual, 1 (mild systemic disease that does not limit activity), 2 (severe systemic disease that limits activity but is not incapacitating), 3 (incapacitating systemic disease which is constantly life-threatening), 4 (moribund -not expected to survive 24 hours with or without surgery).<sup>13</sup>
7. Prefracture residence. This was included as an additive categorical variable, with values 0 (baseline- own home/sheltered housing) 1 (nursing care/residential care),<sup>3</sup>
8. Prefracture ambulation. This was included as an additive categorical variable with values 0 (baseline for no functional ambulation), 1 (outdoor ambulation) and 2 (indoor ambulation).<sup>14</sup>
9. Day of admission. This was included as an additive categorical variable with values 0 (baseline for Monday-Friday) and 1 (Saturday-Sunday),<sup>15</sup>
10. Calendar year of admission (2014, 2015, 2016) as a proxy for changes in practice and funding.
11. Processes timing of surgery (within 36-hour target time, not within 36-hour target time)<sup>16</sup> and
12. Procedure type (internal fixation, hemiarthroplasty/arthroplasty).<sup>17</sup>
13. Structures hospital volume (low (less than first quartile), medium (second and third quartile), or high (fourth quartile) volume at admission based on the average annual number of surgeries at the admitting hospital),<sup>15</sup>

Balance checks for the propensity score were carried out using the Stata add-on package *somersd*<sup>8</sup> to estimate unadjusted (unweighted) and average treatment effect (ATE)-weighted versions of Somers' *D* of the propensity score, and of the confounder variables in relation to mobilisation timing (treatment) variable. The

unadjusted Somers' D of the propensity score with respect to treatment was 0.285, but the ATE-weighted Somers' D of propensity score with respect to treatment was 0.013. As to the confounders variables, values of Somers' D were less than 0.003. These findings suggest that the ATE weights has a balancing property of the propensity score and the confounder variables between the delayed and early mobilised groups (Figure S1). We used the Stata add-on package *hai*<sup>9</sup> to compute homoscedastic variance and standard-error inflation factors due to ATE weighting for the treatment effect in an equal-variance model, assuming that variances were equal and that the ATE weighting was not really necessary. We concluded that ATE weighting was not expected to inflate the variance or the standard error badly.

Figure a shows the confounder categories vs Somers' D scores in the unadjusted and the weighted scenario. It illustrates how the ATE-weighted propensity scores for confounders are uniformly and greatly reduced as compared to the unadjusted scenario. This suggests that the propensity score perfectly performs as an overall predictor.



**Figure a.** Chart of confounder categories vs Somers' D score for mobilization timing outcome.

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## Results from the analyses of the imputed data

### Sensitivity analysis results

1. The unadjusted and weighted odds ratios of survival at 30-days postoperatively were 2.92 (95% 2.79-3.06) and 2.02 (95% 1.91-2.10) (or 2.02 (95% 1.92-2.12) using the average of propensity scores across the 50 completed datasets) respectively among those who first mobilised on the day of or day after surgery compared with those who first mobilised 2 days or more after surgery.
2. Among patients without dementia the unadjusted and weighted odds ratios of survival at 30-days postoperatively were 3.08 (95% CI 2.30-4.14) and 2.17 (95% CI 1.82-2.58) (or 2.16 (95% CI 1.84-2.54)) respectively among those who first mobilised on the day of or day after surgery compared with those who first mobilised 2 days or more after surgery
3. Among those with dementia, the unadjusted and weighted odds of survival at 30-days postoperatively were 2.30 (95% CI 1.71-3.08) and 1.83 (95% CI 1.54-2.17) (or 95% CI 1.84 (1.57- 2.17)) respectively among those who first mobilised on the day of or day after surgery compared with those who first mobilised 2 days or more after surgery.



**Table i.** Imputation functions used in MICE process.

Variable	Method	Description	Scale type
SEXM, MOB_TIMING, FRACTYPE, RESIDEMCE, PXTYPE, SX_YR, Sx_TIMING, DAYADM, HRTFAIL, COPD, HYP, HYPO, CDYS, DIA, IHDA, IHDC, DEMENTIA, DEPR, DELIRIUM, Surv30Day	Logreg	Logistic regression	Factor, 2 levels
AGE, PREFRAFUN , ETHNIC,	Polyreg	Polytomous regression	Factor, > 2 levels
DEPRIVATION4, ASA	regress	regression	Ordinal variable considered as continuous

**Table ii.** Odd ratios estimate from the sensitivity analysis of day 30 survival by timing of mobilisation among 170,937 patients surgically treated for non-pathological first hip fracture, overall, and by dementia,

Mobilization timing	Unweighted OR (95% CI)	Weighted OR* (95% CI) <sup>†</sup>	Weighted OR (95% CI) <sup>*</sup>
<b>Overall</b>			
Delayed mobilization	1.00	1.00	1.00
Early mobilization	2.92 (2.79 to 3.06)	2.02 (1.91 to 2.10)	2.02 (1.92 to 2.12)
<b>Without dementia</b>			
Delayed mobilization	1.00	1.00	1.00
Early mobilization	3.08 (2.30 to 4.14)	2.17 (1.82 to 2.58)	2.16 (1.84 to 2.54)
<b>With dementia</b>			
Delayed mobilization	1.00	1.00	1.00
Early mobilization	2.30 (1.71 to 3.08)	1.83 (1.54 to 2.17)	1.84 (1.57 to 2.17)

\* Obtained using propensity scores estimated in each of the 50 imputed completed datasets where we imputed the missing values for the outcome survival at 30 days post admission and covariates (confounders: age, sex,

ethnicity, comorbidities, fracture type, fracture surgery type, surgery timing, fracture year calendar, deprivation, week day of admission, prefracture residence, American Society of Anesthesiologists grade, and prefracture ambulation). <sup>†</sup>The ORs estimated from each of the 50 datasets were averaged to obtain this multiple imputation point estimate of the OR. The average of the 50 propensity scores for each record across the 50 datasets was used as a single propensity score to obtain the ORs estimates from the 50 datasets and these were averaged to obtain this multiple imputation point.

CI, confidence interval; OR odds ratio.