Creating an Analytical Dataset for Studying Effects of Rehabilitation Duration, Frequency and Type on Outcomes of Hip Fracture Surgery

Katie Jane Sheehan, Orouba Almilaji, Aicha Goubar

Technical Report 1-20

Foreword

This report has been prepared by Aicha Goubar, Orouba Almilaji, and Katie Sheehan. The study objective is to compare health outcomes among patients exposed to various rehabilitation duration, frequency, and types after hip fracture surgery.

Principal Investigator:

Katie Jane Sheehan, PhD

Investigators:

Katie Jane Sheehan, Aicha Goubar, Salma Ayis, Catherine Sackley, Finbarr Martin, Toby Smith, Antony Johansen, Celia Gregson, Euan Sadler, Ian Cameron, Morten Tange Kristensen, Lauren Beaupre, Boris Sobolev, Jay Magaziner.

Data Management:

Aicha Goubar and Orouba Almilaji

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1. INTRODUCTION

The report describes creation of analytical dataset including data linkage, data cleaning, and the identification of new variables from the Physiotherapy 'Hip Sprint' Audit, the National Hip Fracture Database, and English/Welsh hospitalisation records.

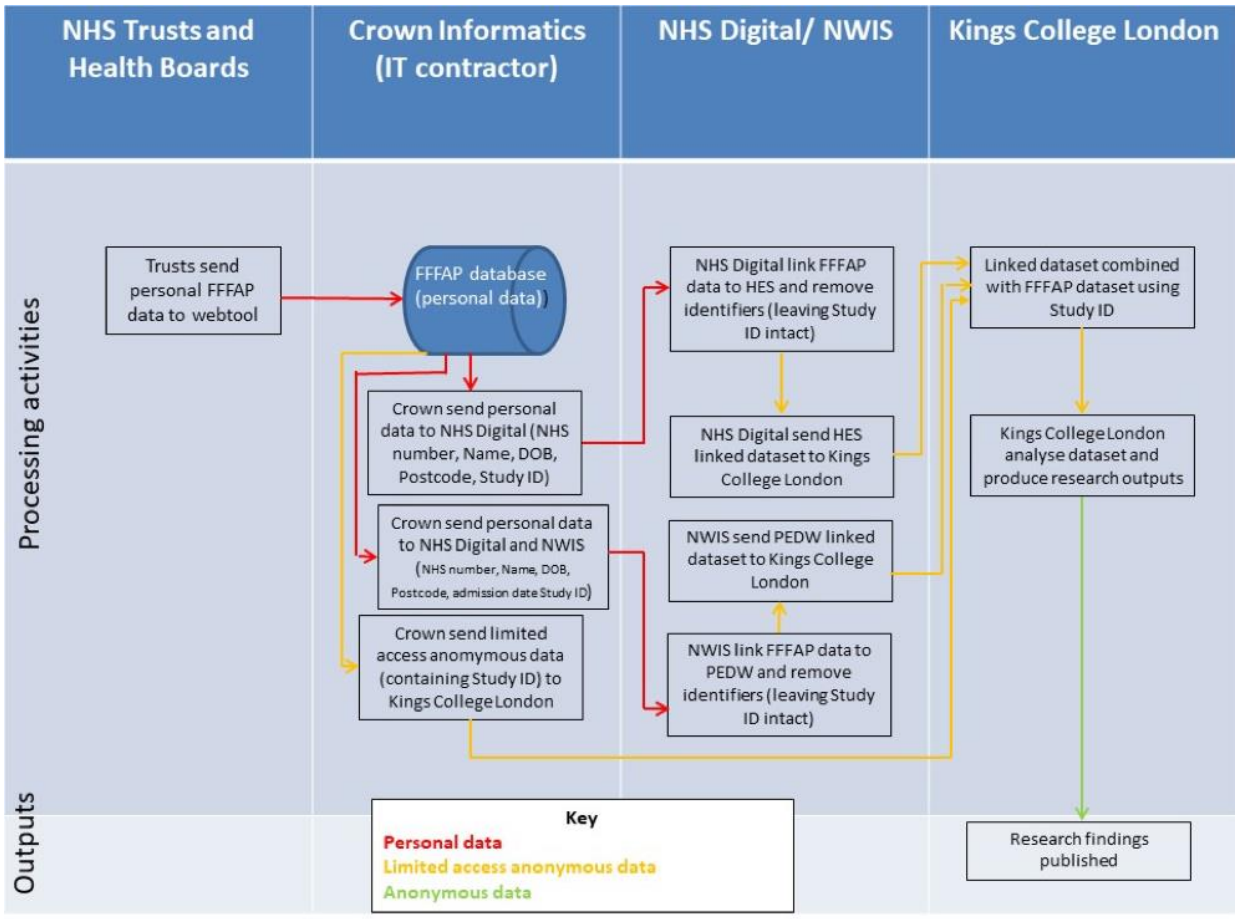
1.1 Data flow

We requested data from:

1. Physiotherapy Hip Fracture Sprint Audit (PHFSA), Falls and Fragility Fracture Audit Programme (FFFAP) (Data processor: Crown Informatics on behalf of data controller Healthcare Quality Improvement Partnership (HQIP));
2. Acute Facilities Audit (AcuteFA), FFFAP (Data processor: Crown Informatics on behalf of data controller HQIP);
3. National Hip Fracture Database (NHFD), FFFAP (Data processor: Crown Informatics on behalf of data controller HQIP);
4. Hospital Episode Statistics (HES) (Data controller: National Health Service Digital (NHSD));
5. Patient Episode Database for Wales (PEDW) (Data controller: NHS Wales Informatics Service (NWIS)).

The Study cohort was identified by Crown Informatics. Personal identifiers were sent to NHSD and NWIS to enable the identification of the study cohort in HES and PEDW. Personal identifiers were then removed by Crown Informatics, NHSD, and NWIS (leaving a Study identifier (ID) intact) prior to release of 5 datasets to Kings College London (KCL). Data flow is outlined in Figure 1.

Figure 1: Data flow



1.2 Data summary

A Study ID reflects a hip fracture care spell. In total, we received 6,428 unique Study ID's from PHFSA. For NHFD, we received 10,296 unique Study ID's. For NWIS, we received 554 unique Study ID's. For NHSD we received 9,553 unique Study ID's (Table 1).

Table 1: Summary of data from NHFD, PHFSA, NHSD, NWIS, and AcuteFA

	DATASET				
	NHFD	PHFSA	NHSD	NWIS	AcuteFA
Number of rows	10,440	6,584	125,642	676	73
Number of rows with non-unique Study ID	72	54	62,814	0	NA
Number of columns	28	144	31	81	20
Unique Number of Study ID's*	10,296	6,428	9,553	554	NA

*Following removal of rows with non-unique Study ID

1.3 Data structure

1.3.1 Physiotherapy Hip Fracture Sprint Audit (PHFSA)

We requested Study ID, Hospital, Trust, and for each of the first seven days physiotherapy postoperatively: Intensity and quality of therapy: what therapy? Intensity and quality of therapy: by whom? Intensity and quality of therapy: for how long? Intensity and quality of therapy: if not, why not? How do you get around?

We received 6,584 care spells (54 duplicates) for 6,428 unique Study ID's.

1.3.2 Acute 'Facilities Audit' (AcuteFA)

We requested Study ID, what are your services normal working hours on week days? Who typically provides physiotherapist-led rehabilitation on weekdays in the first week post-op? Who typically provides physiotherapist-led rehabilitation at weekends in the first week post op.? On which days of the week could your service provide physiotherapy led mobilisation to hip fracture patients on the day after their operation? Are you able to continue physiotherapist-led rehabilitation for all hip fracture patients every day until they have achieved their rehabilitation goals? Do physiotherapists involved attend a trauma and orthopaedic clinical governance meeting? What do you feel limits your ability to provide physiotherapist-led rehabilitation (select up to 2)? Do you have adequate space for rehabilitation? What functional outcome measure do you routinely use? What quality of life outcome measure do you routinely use?

We received 73 hospital audits for 66 Trust.

1.3.3 National Hip Fracture Database (NHFD)

We requested Study ID, Days from A&E admission to orthopaedic/orthogeriatric ward admission, Weekend A&E admission, Weekend orthopaedic/orthogeriatric ward admission, After hours A&E admission, After hours orthopaedic/orthogeriatric ward admission, Days from orthopaedic/ orthogeriatric ward admission to surgery, Weekend surgery, After hours surgery, Age at admission, Sex, Admitted from, Pre-fracture mobility, AMTS preop, AMTS postop, Type of fracture, Pathological, Days from surgery to discharge from acute orthopaedic ward, ASA grade, Type of anaesthesia, Reason if delayed >36 hours, Operation performed, Mobilised on day of or day following surgery, Discharge destination from acute orthopaedic ward, Residential status: 30 days, and Mobility at 120 days.

We received 10,440 care spells of which 72 were records with a non-unique Study ID (Crown Informatics indicated: 20 Bilateral fractures, 42 hospital errors, 6 duplicate records and 4 Misidentified patients (a pair of records with the same NHS number but differing patient names/DoB). Care spells of the patients with these records were excluded leaving 10,296 unique Study ID's.

1.3.4 Hospital episode statistics (NHSD)

We requested Study ID, ethnicity, IMD index of multiple deprivation, IMD health and disability domain, IMD overall rank, diagnosis codes (up to 20) and fact of death at 30-days for hip fracture care spells during the study period. We also requested diagnosis codes (up to 20 per care spell) for all care spells in the year prior to the hip fracture care spell (irrespective of admitting diagnosis) and any care spells that occurred in the 30-days post discharge from the hip fracture care spell.

We received 125,642 care spells from NHSD for 9,553 unique Study ID's. 62,814 care spells were kept, and the rests were duplicates. Readmission is identified by considering the repetition of the study id within 30-days from the discharge date, given that the admission date for the same study ID was in the period of [2017-05-01, 2017-06-30].

1.3.5 Patient episode database for Wales (NWIS)

We requested Study ID, ethnicity, IMD index of multiple deprivation, IMD health and disability domain, IMD overall rank, diagnosis codes (up to 14) and fact of death at 30-days for hip fracture care spells during the study period. We also requested any care spells that occurred in the 30-days post discharge from the hip fracture care spell.

We received 676 care spells (0 duplicates) for 554 unique Study ID's.

2. PREPEARING DATA

2.1 Data validation

1. In the final dataset, we included data for Study ID's from PHFSA if the same Study ID's were present in NHFD. We identified 483 unique Study ID's (496 rows) in PHFSA that do not exist in NHFD. We removed these 483 unique Study ID's.
2. In the final dataset, we included one row per Study ID from PHFSA. We identified 85 unique Study ID's occurring on 2 rows and 2 unique Study ID's occurring on 3 rows. We retained the most complete Study ID only.
3. In the final dataset, we included data for Study IDs from either NWIS or NHSD. We identified 63 Study ID's (with 68 rows) common to NWIS and NHSD. We retained data from NHSD only.
4. In the final dataset, we included data for Study ID's from NHSD and NWIS if the same Study ID's were present in NHFD. We identified 73 unique Study ID's (516 rows) in NHSD and NWIS that do not exist in NHFD. We removed these 73 unique Study ID's.

2.2 Variables for the analytical dataset

1. We retained variables from the original datasets (section 3.1) with the application of predefined rules for the following:
    a. Blank fields in the variables for durations of physiotherapy in minutes received on each day (Day 0 to Day 6) during the first week postoperative were interpreted following four rules:
        i. If physiotherapy was not received on day X for a recorded reason and the type of physiotherapy is missing then blank cell for duration was imputed to 0 minutes.
        ii. If physiotherapy was not received on day X for a recorded reason and the type of physiotherapy is recorded then blank cell for duration was considered missing.

iii. If no reason is given for physiotherapy not been received on day X and the type of physiotherapy is missing then blank cell for duration was imputed to 0.
iv. If no reason is given for physiotherapy not been received on day X and the type of physiotherapy is recorded then blank cell for duration was considered missing.

2. We created new variables for the analytical dataset (section 3.2). In particular,
    a. Hospital frailty risk score (HFS) and Charlson Comorbidity Index scores (CCI) was were calculated using all available diagnostic codes that were documented in the year prior to hip fracture surgery for each patient from the NHSD and NWIS following published guidance from:
        - Gilbert T, Neuburger J, Kraindler J, Keeble E, Smith P, Ariti C, Arora S, Street A, Parker S, Roberts HC, Bardsley M. Development and validation of a Hospital Frailty Risk Score focusing on older people in acute care settings using electronic hospital records: an observational study. The Lancet. 2018 May 5;391(10132):1775-82.
        - Deyo RA, Cherkin DC, Ciol MA. Adapting a clinical comorbidity index for use with ICD-9-CM administrative databases. J Clin Epidemiol. 1992; 45: 613-9
    b. Defined readmission as the repetition of the study id within 30-days from the discharge date:
        i. If an admission date is in the study time period [2017-05-01, 2017-06-30] and another admission date is found within 30-days post discharge then readmission was imputed to 1.
        ii. If an admission date is in the study time period [2017-05-01, 2017-06-30] but no other admission is found in that time period, readmission was imputed to 0.
        iii. If no admission date is recorded in the time period of [2017-05-01, 2017-07-31], readmission was imputed to 0.

2.3 Linking data

We created three mutually exclusive datasets, all subsets of NHFD, using Study ID as the common data element (Figure 2, Table 2):

- NHFD set (excluding study IDs not existing in NHSD or NWIS),
- NHSD set (including the common study IDs with NWIS)
- and NWIS set (excluding study IDs common with NHSD).

These three datasets were reunited in one final dataset that we linked to PHFSA using Study ID. The final dataset was linked to AcuteFA using Hospital as the common data element between AcuteFA and NHFD.

Table 2: datasets after cleaning

	DATASET				
	NHFD	PHFSA	NHSD	NWIS	AcuteFA
Number of columns	28	144	31	81	20
No of rows	10,296	5,858	62,300	598	73
No. of unique Study IDs	10,296	5,858	9,483	488	NA

Figure 2: The intersections among datasets per study IDs

3. VARIABLES IN THE ANALYTICAL DATASET

3.1 Original variables

We retained Study ID (patients' identifiers), age, sex, hospital at surgery, accident and emergency length of stay, preoperative length of stay, and postoperative length of stay in the analytical dataset (Table 3).

Table 3 Original variables retained in the analytical dataset

Variable	Description	Data field / Database	Code or values
STUDY_ID	Unique ID to identify individual care spells.	1 - NHFD	Nominal
AGE	Age at admission.	13 - NHFD	positive integer NA - missing
SEX	Sex.	14 - NHFD	0 - Female 1 – Male NA- missing
HOSPITAL	Hospital at surgery.	3 - NHFD	Nominal

AE_LOS	Days from AE admission to orthopaedic/ orthogeriatric ward admission.	4 - NHFD	positive integer NA- missing
PREOP_LOS	Days from orthopaedic orthogeriatric ward admission to surgery.	10 - NHFD	positive integer NA – missing
POSTOP_LOS	Days from surgery to discharge from acute orthopaedic ward.	26 - NHFD	positive integer NA – missing

3.2 New variables

Other variables calculated for the analytical dataset include patient and system factors, which may affect rehabilitation and outcomes after hip fracture surgery, as well as study outcome variables (Table 4).

Table 4: New variables included in the analytical dataset

Variable	Description	Data field / Database	Code or values
DATASET	Name of mutually exclusively dataset- NHFD, NHSD, NWIS	Calculated based on StudyID from NHFD, NWIS and NHSD	Character NHFDOnly- NHFD only NHSDOnly- NHSD only NWISOnly- NWIS only
PATHHF	Pathological fracture at index admission.	Calculated from diagnosis codes [NWIS/NHSD databases] [NHFD]	0 – No 1 – Yes (C34, C50, C61, C64, C65, C78,C79, C80, C90) NA– Missing
PAGET	Presentation of Paget's disease of the bone in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 -No 1 – Yes (M88) NA– Missing
HRTFAIL	Presentation of heart failure or pulmonary edema in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 I50, J81) NA– Missing
COPD	Presentation of chronic obstructive pulmonary diseases in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 J41, J42, J43, J44, J47) NA– Missing

IHDA	Presentation of ischemic heart disease (acute) in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 I20, I21, I22, I24) NA– Missing
CDYS	Presentation of cardiac dysrhythmias in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 I47, I48, I49) NA– Missing
IHDC	Presentation of ischemic heart disease (chronic) in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 I25) NA– Missing
HYP	Presentation of hypertension in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 I10, I11) NA– Missing
HYPO	Presentation of hypotension in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 I95) NA– Missing
DIA	Presentation of diabetes with complication in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 – No 1 – Yes (ICD-10 E100-E108, E110-E118, E130-E138, E140-E148) NA– Missing
DEMENTIA	Presentation of Alzheimer's or dementia in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 -No 1 – Yes (ICD-10 F00, F01, F02, F03, G30) NA– Missing
DEPR	Presentation of depression in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 -No 1 – Yes (ICD-10 F204, F32, F33, F34, F43) NA– Missing

DELIRIUM	Presentation of delirium in year prior to, and including admission	Calculated from diagnosis codes [NWIS/NHSD databases]	0 -No 1 – Yes (ICD-10 F05) NA– Missing
HFR_score	Hospital frailty risk score	Calculated from diagnosis codes [NWIS/NHSD databases]	Integer NA-missing
HFR	Hospital frailty risk group	Calculated from HFR_score [Analytical dataset]	• Lowe risk • Intermeridate risk • Higher Risk NA-missing
CCI_score	Charlson Comorbidity index Score	Calculated from diagnosis codes [NWIS/NHSD databases]	Integer ranged 0-9 NA-missing
CCI	Charlson Comorbidity index group	Calculated from CCI_score [Analytical dataset]	0- CCI=0 1- CCI=1 or 2 2- CCI=3 or 4 3- CCI >=5
CCI_wscore	Charlson Comorbidity index Score	Calculated from diagnosis codes [NWIS/NHSD databases]	Integer ranged 0-14 NA-missing
CCI_w	Charlson Comorbidity Score group	Calculated from CCI_wscore [Analytical dataset]	0- CCI=0 1- CCI=1 or 2 2- CCI=3 or 4 3- CCI >=5
PREOP_DEL_AMTS	Presentation of delirium during admission before surgery	Calculated from AMTS preop score [NHFD]	0 -No 1- Yes (AMTS score of 6 or less) NA- missing
POSTOP_DEL_AMTS	Presentation of delirium during admission after surgery	Calculated from AMTS postop score [NHFD]	0 -No 1- Yes (AMTS score of 6 or less) NA- missing
DEL_AMTS	Presentation of delirium during admission	Calculated from AMTS preop and postop score [NHFD]	0 -No 1- Yes (AMTS score of 6 or less in either or both preop and postop AMTS) NA - missing

COMORBIDCOUNT	Count of comorbid diagnoses	Calculated from count of diagnosis codes for HRTFAIL, COPD, IHDA, CDYS, IHDC, HYP, HYPO, DIA, DEMENTIA, DEPR, DELIRIUM [analytical dataset]	positive integer
ETHNICITY		[NHSD]	0 - White 1- White and Black Caribbean (Mixed) 2- White and Black African (Mixed) 3 - White and Asian (Mixed) 4 - Any other Mixed background 5 - Asian/Asian British 6 – Black or Black British 7 - Chinese NA- missing
DEPRIVATION1	IMD Index of multiple deprivation	IMD04 [NHSD]	positive integer NA - missing
DEPRIVATION2	IMD Heath and disability domain value	IMD04HD [NHSD]	positive integer NA- missing
DEPRIVATION3	IMD Overall rank	IMD04RK [NHSD]	positive integer NA- missing

DEPRIVATION4	IMD Decile Group	Calculated from IMD04RK [NHSD and NWIS]	0 - least deprived 10% 1 -less deprived 10-20% 2 - less deprived 20-30% 3 - less deprived 30-40% 4- less deprived 40-50% 5- more deprived 40-50% 6 - more deprived 30-40% 7- more deprived 20-30% 8- more deprived 10-20% 9- most deprived 10% NA - missing
DAYADM	Indicator of admission on weekend or weekday.	Calculated from: weekend a&e admission and weekend orthopaedic/orthogeriatric ward admission [NHFD]	0 - weekday (Monday-Friday) 1 - weekend (Saturday-Sunday) NA- missing
TIMEADM	Indicator of admission after hours or during working hours.	Calculated from: after hours a&e admission and after hours orthopaedic/orthogeriatric ward admission [NHFD]	0 – working hours 1- after hours (19:00 – 06:59) NA - missing
RESIDENCE	Prefracture residence	Calculated from Admitted from [NHFD]	0 – Own home/sheltered housing 1- nursing care/residential care NA- missing
FR_TYPE	Subtype of hip fracture at admission	Calculated from: Fracture type [NHFD]	0 – Intracapsular 1 – Intertrochanteric 2 – Subtrochanteric NA- missing
SXFLAG	Flag for any record of hip fracture surgery	Calculated from Operation type [NHFD]	0 - No 1 – Yes NA - missing
Sx_TIMING	Indicator of surgery within target time of 36 hours.	Calculated from reason if delayed >36 hours [NHFD]	0 - yes 1- no NA - missing

AdmSxDelay	Indicator of administrative surgical delay	Calculated from reason if delayed >36 hours [NHFD]	0 - no (/not delayed) 1- yes NA– missing/medical reason for delay
MedSxDelay	Indicator of medical surgical delay	Calculated from reason if delayed >36 hours [NHFD]	0 - no (/not delayed) 1- yes NA – missing/administrative reason for delay
ANAESTH	Type of anaesthesia	Calculated from X4.03v10.Anaesthesia [NHFD]	0 - General (GA) 1 - Spinal (SA) NA - missing
PROCTYPE	Procedure type	Calculated from: Operation type [NHFD]	0 – no operation performed 1 - Internal fixation 2 - Hemi 3 - THR NA- missing
MOB_TIMING	Indicator of mobilisation after surgery within target time of day of/day after.	Calculated from: mobilisation on day of surgery [NHFD]	0 - Within target time 1 - After target time NA - missing
TOTAL_LOS	Total length of stay	Sum of "Days.from.A.E.admission.to.orthopaedic.orthogeriatric.ward.admission...Integer.", "Days.from.orthopaedic.orthogeriatric.ward.admission.to.surgery...Integer.", "Days.from.surgery.to.discharge.from.acute.orthopaedic.ward....Integer." [NHFD]	Positive integer NA- missing
HOSPITALDEATH	Indicator of inhospital death	Calculated from: discharge destination from acute orthopaedic ward [NHFD]	0 – no 1 – yes NA - missing

DISCHARGEDEST	Discharge destination	Calculated from: X6.02v9.Ward.discharge.destination [NHFD]	0 – Own home/sheltered housing 1- nursing care/residential care 2 – rehabilitation unit 3 – acute hospital/unit 4 - dead NA– missing/Other
READMIT30	Indicator of readmission within 30-days of discharge from hip fracture care spell	Calculated from: discharge date [NHSD] Check first admission to be in the study period Then check discharge date. New admission should be with 30 days of the last discharge date	0 – no 1 – yes NA – missing
DEATH30	Indicator of death at 30 days	Calculated from: fact of death at 30 days post admission [NHSD , NWIS]	0 – no 1 – yes NA - missing
PREFRACTURE_MOB	Level of mobility prior to hip fracture.	Calculated from: Pre.fracture.mobility [NHFD]	0- Freely mobile without aids 1 - Mobile outdoors with one aid 2 - Mobile outdoors with two aids or frame 3 – Some indoor mobility but never goes outside without help 4 - No functional mobility NA- missing

ASA	The American Society of Anesthesiologists (ASA) physical status classification system was developed to offer clinicians a simple categorization of a patient's physiological status that can be helpful in predicting operative risk.	Calculated from: X4.02v10.ASA.Grade [NHFD]	0 - 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 NA- missing
RESIDENCE120	Residence at 120 days post fracture	Calculated from X8.01v9.Residential.120.days [NHFD]	0 – Own home/sheltered housing 1- nursing care/residential care 2 – rehabilitation unit 3 – acute hospital 4 - dead NA – missing/NA/Other/Unknown
RECOVERY120	Indicator of mobility recovery at 120 days	Calculated as no change (or an improvement) in the measure of function (X8.02v8.Mobility.at.120.days) from prefracture to 120-days post-fracture. The NHFD defines function as mobile without aids, mobile outdoors with one aid, mobile outdoors with two aids or frame, some indoor mobility but never goes outside without help, or no functional mobility. [NHFD]	0 – no 1 – yes NA - missing

EXT_HR	Indicator of extended hours in physiotherapy service	Calculated from 3b. services working hours [Acute Facilities Audit]	0 – No (Monday to Friday (0800-1600/1700)) 1 – Yes (Monday to Friday (extended hours)) NA-Missing
Staff_WEEKD	Indicator of rehabilitation staff case mix on weekdays	Calculated from 2a. physio rehab Weekdays [Acute Facilities Audit]	0 –Physiotherapists/ physiotherapy assistants/ nurses/OT/OT assistants 1 – Physiotherapists/ physiotherapy assistants 2– Physiotherapists
Staff_WEEKE	Indicator of rehabilitation staff case mix on weekend	Calculated from 2b. physio rehab Weekends [Acute Facilities Audit]	0 –Physiotherapists/ physiotherapy assistants/ nurses/OT/OT assistants 1 – Physiotherapists/ physiotherapy assistants 2– Physiotherapists NA-Missing
PT_Staff_Week	Indicator of physiotherapy staff during week	Calculated from 3a. physio available to mobilise [Acute Facilities Audit]	0– Monday to Friday 1– Monday to Saturday 2– Monday to Sunday (Saturday and Sunday half day) 3– Monday to Sunday (Saturday full day and Sunday half day) 4– Monday to Sunday (Saturday and Sunday full days)
REHAB_GOALS	Indicator of whether rehabilitation is goal orientated	Calculated from 3c. Continue rehab to achieve goals [Acute Facilities Audit]	0 – No 1 – Monday to Friday 2 – Monday to Sunday

GOVERNANCE	Indicator of whether physiotherapists attend governance meetings	Calculated from 5. physio attend gov meetings [Acute Facilities Audit]	0 – No 1 – Yes 2 – no meetings occur NA: Missing
REHAB_SPACE	Indicator of adequate space for rehabilitation	Calculated from 12. adequate space for rehab [Acute Facilities Audit]	0 -No 1 – Yes in hospital 2 – Yes on ward &within the word NA-Missing
Fx_Mx	Functional outcome measures used by physiotherapy team	Calculated from 9. functional outcome measure [Acute Facilities Audit]	0 – No 1 – Yes NA-Missing
QOL_Mx	Quality of life outcome measures used by physiotherapy team	Calculated from 10. life outcome measures [Acute Facilities Audit]	0 – No 1 – Yes NA-Missing
PT_FTE	Indicator of perceived insufficient staffing to meet demand	Calculated from 4. Limit = lack of physiotherapy full time equivalent [Acute Facilities Audit]	0 – No 1 – Yes NA-Missing
PT_FTE2	Indicator of perceived insufficient staffing due to sick/maternity to meet demand	Calculated from 4. Limit = absence (sick/maternity) [Acute Facilities Audit]	0 – No 1 – Yes NA-Missing
PT_WE	Indicator of perceived insufficient weekend staffing to meet demand	Calculated from 4. Limit = no weekend staff cover [Acute Facilities Audit]	0 – No 1 – Yes NA-Missing
PT_EQ	Indicator of perceived insufficient equipment to support goal attainment	Calculated from 4. Limit = lack of equipment [Acute Facilities Audit]	0 – No 1 – Yes NA-Missing
PT_BEDS	Indicator of perceived insufficient bed capacity to support goal attainment	Calculated from 4. Limit = hospital capacity (beds) [Acute Facilities Audit]	0 – No 1 – Yes NA-Missing

ISPHFSA	Indicator of being included in PHFSA	Calculated in [PHFSA]	0 – No 1 – Yes
PTDAY0	Indicator of physiotherapy day 0	Calculated from 'Day0Moblised' 'Day0GAIT' 'Day0ROM Exercise' 'Day0 Strength' 'Day0 Balance' Day0 Transfer Practice' [PHFSA]	0 – No 1 – Yes NA -Missing
PTDAY1	Indicator of physiotherapy day 1	Calculated from 'Day1Moblised' 'Day1GAIT' 'Day1ROM Exercise' 'Day1Strength' 'Day1Balance' Day1 Transfer Practice' [PHFSA]	0 – No 1 – Yes NA – Missing
PTDAY2	Indicator of physiotherapy day 2	Calculated from 'Day2Moblised' 'Day2GAIT' 'Day2ROM Exercise' 'Day2Strength' 'Day2Balance' Day2 Transfer Practice' [PHFSA]	0 – No 1 – Yes NA – Missing
PTDAY3	Indicator of physiotherapy day 3	Calculated from 'Day3Moblised' 'Day3GAIT' 'Day3ROM Exercise' 'Day3Strength' 'Day3Balance' Day3 Transfer Practice' [PHFSA]	0 – No 1 – Yes NA – Missing
PTDAY4	Indicator of physiotherapy day 4	Calculated from 'Day4Moblised' 'Day4GAIT' 'Day4ROM Exercise' 'Day4Strength' 'Day4Balance' Day4 Transfer Practice' [PHFSA]	0 – No 1 – Yes NA – Missing
PTDAY5	Indicator of physiotherapy day 5	Calculated from 'Day5Moblised' 'Day5GAIT' 'Day5ROM Exercise' 'Day5Strength' 'Day5Balance' Day5 Transfer Practice' [PHFSA]	0 – No 1 – Yes NA – Missing

PTDAY6	Indicator of physiotherapy day 6	Calculated from 'Day6Moblised' 'Day6GAIT' 'Day6ROM Exercise' 'Day6Strength' 'Day6Balance' Day6 Transfer Practice' [PHFSA]	0 – No 1 – Yes NA– Missing
FREQUENCY	Days of physiotherapy received in the first postoperative week	Calculated from PTDAY0 – PTDAY6 [Analytical dataset]	positive integer NA – Missing
FREQUENCY_IND	Indicator of 0-5 vs. 6-7 days physiotherapy	Calculated from FREQUENCY [Analytical dataset]	0 – 0-5 days 1 – 6-7 days NA – Missing
DURATION_0	Duration of physiotherapy (in minutes) received on the first postoperative day	Calculated from 'Day0.Physio.time', 'Rehab.Day.0' and 'No.Rehab.Day.0' '[PHFSA]	Positive integer NA-Missing
DURATION_1	Duration of physiotherapy (in minutes) received on the second postoperative day	Calculated from 'Day1.Physio.time' ' [PHFSA]	Positive integer NA-Missing
DURATION_2	Duration of physiotherapy (in minutes) received on the third postoperative day	Calculated from 'Day2.Physio.time' ' [PHFSA]	Positive integer NA-Missing
DURATION_3	Duration of physiotherapy (in minutes) received on the fourth postoperative day	Calculated from 'Day3.Physio.time' ' [PHFSA]	Positive integer NA-Missing
DURATION_4	Duration of physiotherapy (in minutes) received on the fifth postoperative day	Calculated from 'Day4.Physio.time' ' [PHFSA]	Positive integer NA-Missing

DURATION_5	Duration of physiotherapy (in minutes) received on the sixth postoperative day	Calculated from 'Day5.Physio.time' ' [PHFSA]	Positive integer NA-Missing
DURATION_6	Duration of physiotherapy (in minutes) received on the seventh postoperative day	Calculated from 'Day6.Physio.time' ' [PHFSA]	Positive integer NA-Missing
DURATION_TOTAL	Total minutes of physiotherapy in the first postoperative week	Calculated from DURATION_0 DURATION_1 DURATION_2 DURATION_3 DURATION_4 DURATION_5 DURATION_6 [Analytical dataset]	positive integer NA- missing
DURATION_ AVG	Total minutes of physiotherapy in the first postoperative week	Calculated from DURATION_0 DURATION_1 DURATION_2 DURATION_3 DURATION_4 DURATION_5 DURATION_6 [Analytical dataset]	positive integer NA- missing
DURATION_2HR	Indicator of rehabilitation duration of ≥2hours in the first week	Calculated from DURATION_TOTAL [Analytical dataset]	0 – <120min 1 – >=120min NA – Missing
PTTYPE0	Indicator of physiotherapy type day 0 – mobilisation vs. mobilisation and exercises	Calculated from Mobilised: 'Day0Moblised' 'Day0GAIT' Day0 Transfer Practice'[PHFSA] and Exercise: 'Day0ROM Exercise' 'Day0 Strength' 'Day0 Balance' [PHFSA]	0 – mobilised not exercise 1 - mobilised and exercise 2 – not mobilised not exercise 3 – not mobilised exercise

PTTYPE1	Indicator of physiotherapy type day 1 – mobilisation vs. mobilisation and exercises	Calculated from 'Day1Moblised' 'Day1GAIT' 'Day1ROM Exercise' 'Day1Strength' 'Day1Balance' Day1 Transfer Practice' [PHFSA]	0 – mobilised not exercise 1 - mobilised and exercise 2 – not mobilised not exercise 3 – not mobilised exercise
PTTYPE2	Indicator of physiotherapy type day 2 – mobilisation vs. mobilisation and exercises	Calculated from 'Day2Moblised' 'Day2GAIT' 'Day2ROM Exercise' 'Day2Strength' 'Day2Balance' Day2 Transfer Practice' [PHFSA]	0 – mobilised not exercise 1 - mobilised and exercise 2 – not mobilised not exercise 3 – not mobilised exercise
PTTYPE3	Indicator of physiotherapy type day 3 – mobilisation vs. mobilisation and exercises	Calculated from 'Day3Moblised' 'Day3GAIT' 'Day3ROM Exercise' 'Day3Strength' 'Day3Balance' Day3 Transfer Practice' [PHFSA]	0 – mobilised not exercise 1 - mobilised and exercise 2 – not mobilised not exercise 3 – not mobilised exercise
PTTYPE4	Indicator of physiotherapy type day 4 – mobilisation vs. mobilisation and exercises	Calculated from 'Day4Moblised' 'Day4GAIT' 'Day4ROM Exercise' 'Day4Strength' 'Day4Balance' Day4 Transfer Practice' [PHFSA]	0 – mobilised not exercise 1 - mobilised and exercise 2 – not mobilised not exercise 3 – not mobilised exercise
PTTYPE5	Indicator of physiotherapy type day 5 – mobilisation vs. mobilisation and exercises	Calculated from 'Day5Moblised' 'Day5GAIT' 'Day5ROM Exercise' 'Day5Strength' 'Day5Balance' Day5 Transfer Practice' [PHFSA]	0 – mobilised not exercise 1 - mobilised and exercise 2 – not mobilised not exercise 3 – not mobilised exercise
PTTYPE6	Indicator of physiotherapy type day 6 – mobilisation vs. mobilisation and exercises	Calculated from 'Day6Moblised' 'Day6GAIT' 'Day6ROM Exercise' 'Day6Strength' 'Day6Balance' Day6 Transfer Practice' [PHFSA]	0 – mobilised not exercise 1 - mobilised and exercise 2 – not mobilised not exercise 3 – not mobilised exercise

PTTYPE_IND	Indicator of physiotherapy type – mobilisation vs. mobilisation and exercises	Calculated from PTTYPE0 – PTTYPE6 [Analytical dataset]	0 – mobilised only in the 7 days [PTTYPE0-PTTYPE6: 0 – mobilised not exercise only OR 0 – mobilised not exercise and 2 – not mobilised not exercise observed across the 7 days] 1 – mobilisation and exercises across the 7 days [PTTYPE0-PTTYPE6: 1 - mobilised and exercise OR 1 - mobilised and exercise AND 2 – not mobilised not exercise OR 1 - mobilised and exercise AND 3 – not mobilised exercise OR 0 – mobilised not exercise AND 1 - mobilised and exercise OR 0 – mobilised not exercise AND 3 – not mobilised exercise OR 2 – not mobilised not exercise AND 3 – not mobilised exercise across the 7 days]
PTTYPE_COUNT	Count of days that physiotherapy type includes both mobilisation and exercises across the 7 days	Calculated from PTTYPE0 – PTTYPE6 [Analytical dataset]	positive integer