Supplementary Materials

Comparative clinical and cost effectiveness of non-ST elevation myocardial infarction management strategies in patients living with kidney impairment during the COVID-19 pandemic: protocol for a target trial emulation using English routinely collected health data

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Supplementary methods

Supplementary methods 1. Clone-Censor-Weight (CCW) analysis

We will use a CCW analysis to avoid introducing immortal time bias into the analysis. Immortal time bias arises when there is a delay between the treatment decision and its actual initiation. As a result, patients need to survive an "immortal" period to receive the treatment.[1]

In our study, early invasive NSTEMI management can be provided from day 0 to 7 (inclusive) of the NSTEMI hospitalisation. People without reported receipt of invasive cardiac management or reported as receiving invasive NSTEMI management later than 7 days are allocated to the conservative management group.

Immortal time bias occurs where all people who die between days 0 to 7 who do not have a record of early invasive NSTEMI management prior to death are assigned to the conservative management group. Because we can only observe the management strategy as recorded in the data, and not the management strategy to which people are 'assigned' by cardiologists at admission, we will misclassify some of those who die with no record of early invasive NSTEMI management to the conservative management group. This will falsely inflate the mortality rate in the conservative management group, biasing the treatment effect in favour of early invasive NSTEMI management.

To avoid this immortal time bias, we will use a CCW analysis.[2-4] CCW involves 3 steps, detailed below.

Step 1: Clone[3]

In this step, each person in the observational data is ‘cloned’. This allows us to assign people to both management groups while the type of NSTEMI management is unknown. This will double the number of people in the study dataset. Every person in the study will enter both treatment groups of the observational emulation, regardless of subsequent management status. These cloned pairs will be identical with respect to demographics and clinical characteristics at the time of NSTEMI hospitalisation, thus removing confounding bias at baseline.[3]

Step 2: Censor[3]

In this step, people will be censored at the point in which their ‘assigned’ management strategy is not compatible with the observed data. For example, in this study, people who are reported as receiving early invasive NSTEMI management between days 0 to 7 of the NSTEMI hospitalisation are censored on the day of the early invasive NSTEMI management in the conservative management group, and people who are not reported as receiving early invasive NSTEMI management between 0 to 7 days of the NSTEMI hospitalisation are censored at day 8 in the early invasive NSTMEI management group (including those who have invasive NSTEMI management beyond day 7 of the NSTEMI hospitalisation).

Events only contribute from people who are still uncensored at the time of the event (i.e., among people are compliant with their ‘assigned’ management status at the time of the event). This means that events happening during the treatment window for those where the treatment group is ‘undetermined’ get counted in both treatment arms. Immortal time bias is removed because the survival time among people who die within the

management window (in this study, 0 to 7 days from NSTEMI admission) who have not received early invasive NSTEMI management contributes to both management groups.[3]

Step 3: Weighting[3]

Because the artificial censoring in step 2 is informative (i.e., NSTEMI management is not assigned randomly in these observational data, and thus the artificial censoring will be confounded), the analysis is prone to selection bias. Inverse probability-of-censoring weighting (IPCW) can be used to up-weight people remaining in the risk set at the end of the 7-day window to maintain comparability between the management groups. A Cox proportional hazards regression model can be used to calculate the weights, adjusted for measured confounders.

Finally, using the weights derived in step 3, we can estimate the per-protocol treatment effect using the weighted analysis model. We will use robust standard errors to account for the falsely increased precision of our estimates due to the larger sample size from step 1.[5]

Supplementary methods 2. Instrumental variable (IV) analysis

We will use an IV analysis in this study to reduce the risk of confounding bias impacting our results. IV analyses exploit unexplained variation in an exposure to infer causal effects, without making the assumption of no unmeasured confounding.[6] However, IV analyses are subject to other IV assumptions, which can only be partially tested.

The instrument and its assumptions

We will use a preference-based instrument to compare the effect of conservative versus early invasive NSTEMI management. We will measure the latent preference variable by calculating the proportion of people who are reported as receiving conservative versus early invasive NSTEMI management in the 6-months prior to each individual's NSTEMI admission date (the 'index date'). Only people who meet the study inclusion criteria will be included in the calculation of the instrument. We will partially evaluate the 4 main IV assumptions before the IV analysis (**Supplementary methods 1 – Table 1**).

Supplementary methods 1 – Table 1. Evaluating the four main IV assumptions in routinely collected health data

Assumption	**Assessment**
1. ***The relevance assumption*** – the instrument strongly predicts the treatment an individual receives.	Testable – calculate the predictive strength of the instrument using the partial F-statistic from the first-stage regression model.[6]

2. ***The exchangeability assumption*** – the instrument is not associated with confounders (measured and unmeasured).	Partially testable – can evaluate the balance of the instrument across standardised levels of measured covariates.[6]
3. ***The exclusion restriction*** – the instrument affects the outcome only via the treatment actually provided.	Untestable – rely on DAGs and clinical judgement.[6]
4. ***The monotonicity assumption*** – an increase in the level of the instrument results in at least the same or an increase in the level of the treatment.	Untestable using routinely collected health data – must rely on clinical judgement.[7]

DAG: directed acyclic graph; IV: instrumental variable

We will use the partial F-statistic from the first-stage regression to evaluate the strength of association between the instrument and the treatment actually received (assumption 1),[6] with a value >100 indicating a strong instrument.[8] Alternative look-back windows will be considered to define the tendency to treat (e.g., 9-months or 12-months) if the instrument is of insufficient strength using a 6-month look-back window.

We will evaluate whether the instrument is associated with measured confounders (assumption 2) by plotting the distribution of measured confounders (standardised) across levels of the instrument. Any potential associations between the instrument and the measured individual- or context-level confounders can be adjusted for in the multivariable IV model. For unmeasured confounders it is not possible to assess whether the instrumental variable is associated with the instrument, and the plausibility of this aspect of the assumption will be informed by clinical opinions. It is also not possible to test whether the instrument affects the outcome only via the treatment (assumption 3)

nor whether changes in the instrument are monotonically associated with changes in the treatment (assumption 4). However, in our DAG (**Figure 2** in the main text), we have not identified any mediators between the IV and the outcome other than the exposure of interest. Adjustments for contextual-level confounders at the hospital-level will be included in our multivariable models, which may act as confounders of the IV and the outcome.

The IV analysis

We will use a 2-stage residual inclusion (2SRI) model in the IV analysis, which can estimate the average treatment effect (ATE) and allow for heterogenous treatment effects according to observed confounders under the monotonicity assumption.[7,9]

The stage 1 model will use a logit or probit model. The dependent variable (reported NSTEMI management strategy) will be regressed on the independent variables (the instrument and other covariates which are predictors of management strategy). The predicted versus actual management strategy observed will be used to calculate generalised residuals.

The stage 2 model will be a Cox proportional hazards model, with the generalised residuals included as an independent variable along with the observed management and all other independent variables (i.e., observed confounders).[10]

Non-parametric bootstrapping with replacement will be used to account for uncertainty in estimating the propensity score and residuals in the stage 1 model.[9]

Supplementary methods 3. Propensity score with inverse probability of treatment weighting (IPTW) analysis

We will conduct a propensity score analysis with inverse probability of treatment weighting (IPTW) as an alternative to the IV analysis.[11] Like the IV analysis, this is a two-stage regression model. In the first stage, the propensity score will be estimated using logistic regression. The propensity score can then be incorporated in several ways to adjust for measured confounders, including IPTW.[12,13] With IPTW, the inverse of the probability of being treated (the propensity score) is used to derive a weight for each individual. Using this weight, a pseudo-population is created in which the confounder distributions in the treated and untreated groups are balanced (in expectation).[11,14] This allows for estimation of the average treatment effect, assuming that there are no unmeasured confounders and that both models are specified correctly.

Supplementary methods 4. Cost-effectiveness analysis

Resource use and unit cost

We will measure resource use items anticipated to be the major drivers of incremental cost for patients hospitalised for NSTEMI. The resource use categories include: the procedures of early invasive cardiac management, hospital length of stay, critical care bed-days (intensive care unit and coronary care unit), dialysis, the number of outpatient visits, and all subsequent re-admissions up to 1-year. Patient-level resource use items will be extracted from HES data for each eligible index admission.

Supplementary table 5 summarises the main resource use items and their associated unit costs, sourced from NHS reference costs and Personal Social Services Research Unit. For each eligible patient, we will calculate the total cost over one year by combining each resource use item with the corresponding unit cost and summing across all items to obtain the total cost per patient up to 1-year.

Outcomes

The main endpoints will be life years, QALYs, total costs, and incremental net monetary benefit. In the base case scenario, life years will be calculated based on survival up to 1-year from 'time zero'. For patients who die within the 1-year period, the exact date of death from the linked Civil Registry of Deaths data will be used to calculate life years.

Due to the unavailability of HRQoL measures in the linked dataset, we will conduct a targeted literature review to identify appropriate estimates. In brief, we will select studies according to the following criteria: i) measure HRQoL for patients with NSTEMI and/or reduced kidney function at baseline, discharge, early follow-up (e.g., 4-6 weeks) and late

follow-up (e.g., 6-12 months) following both conservative or early invasive management. We will also capture HRQoL following hospital readmission due to major events (e.g., AMI, stroke, AKI, heart failure hospitalisation); ii) follow the approach recommended in the NICE methods guide, using the EQ-5D as the preferred generic instrument. All HRQoL values will be adjusted by age and sex according to the England utility norms.[15,16]

If no suitable values are found for NSTEMI patients with reduced kidney function, we will apply a multiplicative approach to estimate the HRQoL for the joint health state by combining HRQoL for NSTEMI and CKD, respectively.[17] **Supplementary table 6** shows the HRQoL values selected for the baseline and follow-up time points.

QALYs will be calculated using the area under the curve method. We will apply the same level of HRQoL at 'time zero' to both comparison groups, and assume this level applies throughout the initial hospitalisation. It is therefore assumed that the length of stay proxies the disutilities associated with surgical complications or drug-related adverse events during the hospitalisation period. If there are no hospital readmissions until 12 months following the index NSTEMI hospitalisation, we will assume that the level of HRQoL improves according to linear trajectories from the index hospitalisation discharge to the 1-month follow-up timepoint, then to the 6-month follow-up timepoint, and finally to the 12-month follow-up timepoint. For patients who have any hospital readmissions, we will assume the HRQoL value drops back to the 'time zero' level. After discharge from hospital, the level of HRQoL will be assumed to improve using the same recovery pattern as the recovery from the initial hospitalisation for the 1-month, 6-month, and 12-month recovery phases, continuing until the 1-year time horizon of the study or death. Upon

death, it is assumed the level of HRQoL will drop to zero immediately. Examples were illustrated in **Supplementary figure 3**.

We will report incremental net monetary benefit of conservative versus invasive NSTEMI management by multiplying the incremental QALYs according to NICE-recommended willingness-to-pay threshold (e.g. £20,000 to £30,000 per QALY) and subtracting the total hospital costs at 1 year.

We will use the same IV analysis as in the comparative effectiveness analysis to estimate the treatment effect for the cost-effectiveness analysis outcomes (total costs, QALYs, and incremental net monetary benefit).

Sensitivity Analyses

We will undertake sensitivity analyses to test whether conclusions are robust to key assumptions. First, to account for the potential long-term impact of invasive cardiac management on costs and quality of life outcomes—particularly for patients with reduced kidney function who may experience kidney failure and require dialysis as a result—we will extend the baseline analysis to the longer 3-year time horizon. The costs and QALYs in years 2 and 3 will be discounted at NICE-recommended rates of 3.5%.[18] Second, we will explore the possibility of variation in HRQoL values in subgroups using evidence from the literature. Third, we will consider alternative scenarios to assess the sensitivity of the results to assumptions about unit costs. Fourth, we will use different interpolation for HRQoL and/or alternative assumptions on the HRQoL recovery from readmissions to calculate the QALY.

Supplementary tables

Supplementary table 1: ICD-10 codes for AMI identified in HES*

AMI subtype	ICD-10 codes
NSTEMI	I21.4, I21.9, I22.9

AMI: acute myocardial infarction; HES: Hospital Episode Statistics; ICD-10: International Classification of Diseases 10th Edition; STEMI: NSTEMI: Non-ST segment elevation myocardial infarction

Supplementary table 2: CALIBER definition of AMI subtypes (STEMI, NSTEMI) using MINAP data.*

	MINAP variable		
AMI subtype	**Discharge diagnosis**	**Markers elevated?**	**ECG result**
Other	Threatened MI, Chest pain uncertain cause, MI unconfirmed, other diagnosis	-	-
STEMI	STEMI	Raised or missing	ST elevation, LBBB, or ST elevation
	NSTEMI/Troponin positive ACS	Raised or missing	ST elevation
	ACS troponin negative	Raised	ST elevation
	ACS troponin unspecified	Raised	ST elevation
NSTEMI	NSTEMI/Troponin positive ACS	Raised or missing	ST depression, T wave changes only, other abnormality, Normal ECG, or LBBB
	ACS troponin negative	Raised	LBBB, ST depression, T wave changes only, Other abnormality, normal ECG, or missing
	ACS troponin unspecified	Raised	LBBB, ST depression, T wave changes only, Other abnormality, normal ECG, or missing
Unstable angina	*Any remaining hospitalisations not assigned as STEMI, NSTEMI, or other diagnosis		

ACS: acute coronary syndrome, AMI: acute myocardial infarction, ECG: electrocardiogram, LBBB: left bundle branch block, MI: myocardial infarction, MINAP: Myocardial Ischaemia National Audit Project, NSTEMI: Non ST-elevation myocardial infarction, STEMI: ST-elevation myocardial infarction

*Table adapted from previous work: Bidulka P, Scott J, Taylor DM, et al. Impact of chronic kidney disease on case ascertainment for hospitalised acute myocardial infarction: an English cohort study. *BMJ Open* 2022;12:e057909. doi: 10.1136/bmjopen-2021-057909

Supplementary table 3: Primary PCI hospitals (where PCI is available all the time) included in this study

Code	Hospital
R0A	Manchester University NHS Foundation Trust
R0D	University Hospitals Dorset NHS Foundation Trust
R1H	Barts Health NHS Trust
RA7	University Hospitals Bristol and Weston NHS Foundation Trust
RA9	Torbay and South Devon NHS Foundation Trust
RAJ	Mid and South Essex NHS Foundation Trust
RAL	Royal Free London NHS Foundation Trust
RBA	Taunton and Somerset NHS Foundation Trust
RBD	Dorset County Hospital NHS Foundation Trust
RBQ	Liverpool Heart and Chest Hospital NHS Foundation Trust
RD1	Royal United Hospitals Bath NHS Foundation Trust
RDD	Basildon and Thurrock University Hospitals NHS Foundation Trust
RDU	Frimley Health NHS Foundation Trust
RDZ	The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust
REF	Royal Cornwall Hospitals NHS Trust
RGM	Royal Papworth Hospital NHS Foundation Trust
RH5	Somerset NHS Foundation Trust
RH8	Royal Devon University Healthcare NHS Foundation Trust
RHM	University Hospital Southampton NHS Foundation Trust
RHQ	Sheffield Teaching Hospitals NHS Foundation Trust
RHU	Portsmouth Hospitals University National Health Service Trust
RHQ	Royal Berkshire NHS Foundation Trust
RHU	Portsmouth Hospitals University National Health Service Trust
RHQ	Royal Berkshire NHS Foundation Trust
RJ1	Guys and St Thomas NHS Foundation Trust
RJ7	St Georges University Hospitals NHS Foundation Trust
RJE	University Hospitals of North Midlands NHS Trust
RJZ	Kings College Hospital NHS Foundation Trust
RK9	University Hospitals Plymouth NHS Trust
RKB	University Hospitals Coventry and Warwickshire NHS Trust
RL4	The Royal Wolverhampton NHS Trust
RLQ	Wye Valley NHS Trust
RM1	Norfolk and Norwich University Hospitals NHS Foundation Trust
RM2	University Hospital of South Manchester NHS Foundation Trust
RN3	Great Western Hospitals NHS Foundation Trust
RN5	Hampshire Hospitals NHS Foundation Trust
RNL	North Cumbria University Hospitals NHS Trust
RNN	North Cumbria Integrated Care NHS Foundation Trust
RNQ	Kettering General Hospital NHS Foundation Trust
RR1	Heart of England NHS Foundation Trust
RR8	Leeds Teaching Hospitals NHS Trust
RRK	University Hospitals Birmingham NHS Foundation Trust
RT3	Royal Brompton & Harefield NHS Foundation Trust
RTD	The Newcastle Upon Tyne Hospitals NHS Foundation Trust
RTE	Gloucestershire Hospitals NHS Foundation Trust

RTG	University Hospitals of Derby and Burton NHS Foundation Trust
RTH	Oxford University Hospitals NHS Foundation Trust
RTK	Ashford and St Peters Hospitals NHS Foundation Trust
RTP	Surrey and Sussex Healthcare NHS Trust
RTR	South Tees Hospitals NHS Foundation Trust
RVV	East Kent Hospitals University NHS Foundation Trust
RW3	Central Manchester University Hospitals NHS Foundation Trust
RWA	Hull University Teaching Hospitals NHS Trust
RWD	United Lincolnshire Hospitals NHS Trust
RWE	University Hospitals of Leicester NHS Trust
RWH	East and North Hertfordshire NHS Trust
RWP	Worcestershire Acute Hospitals NHS Trust
RX1	Nottingham University Hospitals NHS Trust
RXC	East Sussex Healthcare NHS Trust
RXH	Brighton and Sussex University Hospitals NHS Trust
RXK	Sandwell and West Birmingham Hospitals NHS Trust
RXL	Blackpool Teaching Hospitals NHS Foundation Trust
RXQ	Buckinghamshire Healthcare NHS Trust
RXW	The Shrewsbury and Telford Hospital NHS Trust
RYJ	Imperial College Healthcare NHS Trust
RYR	University Hospitals Sussex NHS Foundation Trust

Supplementary table 4: Definitions for components of early invasive cardiac management in MINAP and HES datasets

Process of care	MINAP definition	HES definition
Angiography	Angiography defined using data from the following variables: • Interventional hospital procedure • Coronary angiography • Why no angiography • Procedure performed • Additional reperfusion treatment • Why no intervention • Coronary intervention	Angiography defined by searching the opertn_XX variables (XX=01-24) using the following OPCS codes: • K63
PCI	PCI defined using data from the following variables: • Why no intervention • Coronary intervention • Interventional hospital procedure • Procedure performed at admission • Initial reperfusion treatment • Additional reperfusion treatment	PCI defined by searching the opertn_XX variables (XX=01-24) using the following OPCS codes: • K49 • K50 • K75
CABG	CABG defined using data from the following variables: • Why no intervention • Coronary intervention • Interventional hospital procedure	CABG defined by searching the opertn_XX variables (XX=01-24) using the following OPCS codes: • K40 • K41 • K42 • K43 • K44 • K45 • K46

Supplementary table 5: Unit costs (£2023/24) for potential major cost drivers

Resource Use Item	Unit	Unit cost (suggestive)	Source, definition, and assumptions
Angiogram	procedure	£1850	NHS Reference Costs 2023/24[19]: weighted average of Standard Cardiac Catheterisation across CC scores (codes EY43A, EY43B, EY43C, EY43D, EY43E, EY43F), non-elective inpatient- short stay
-Ward	day	£549	NHS Reference Costs 2017/18[20]: weighted average of Standard Cardiac Catheterisation across CC scores (codes EY43A, EY43B, EY43C, EY43D, EY43E, EY43F), excess bed-day
PCI	procedure	£2710	NHS Reference Costs 2023/24[19]: weighted average of Standard Percutaneous Transluminal Coronary Angioplasty across CC scores (codes EY41A, EY41B, EY41C, EY41D), non-elective inpatient - short stay
-Ward	day	£530	NHS Reference Costs 2017/18[20]: weighted average of Standard Percutaneous Transluminal Coronary Angioplasty across CC scores (codes EY41A, EY41B, EY41C, EY41D), excess bed-day
CABG	procedure	£11200	NHS Reference Costs 2023/24[19]: weighted average of Standard Coronary Artery Bypass Graft across CC scores (codes ED28A, ED28B, ED28C); non-elective inpatient - short stay
-Ward	day	£379	NHS Reference Costs 2017/18[20]: weighted average of Standard Coronary Artery Bypass Graft across CC

Resource Use Item	Unit	Unit cost (suggestive)	Source, definition, and assumptions
			scores (codes ED28A, ED28B, ED28C), excess bed-day
Dialysis	procedure	£844	NHS Reference Costs 2023/24[19]: LE01A - Haemodialysis for Acute Kidney Injury, 19 years and over
Coronary care unit	day	£2110	NHS Reference Costs 2023/24[19]: weighted average of currency codes XC01Z – XC07Z (Adult critical care, different numbers of organs supported) under service code CCU06 (cardiac surgical adult patients predominant)
Intensive care unit	day	£2437	NHS Reference Costs 2023/24[19]: weighted average of currency codes XC01Z – XC07Z (Adult critical care, different numbers of organs supported) under service code CCU01 (non-specific, general adult critical care patients predominate)
GP	minute	£5.26	PSSRU 2022/23: section 9.4. costs and unit estimations for a General Practitioner (GP) with qualification[21]
GP practice nurse	minute	£0.94	PSSRU 2022/23: section 9.3. costs and unit estimations for a GP practice nurse with qualification
Readmissions			
Revascularisation			
-Repeat PCI			Same as above
-Repeat CABG			Same as above
Dialysis for AKI			Same as above
Pneumonia	session	£807	NHS Reference Costs 2022/23[19]: weighted average of Unspecified Acute Lower Respiratory Infection with Interventions across CC scores (currency codes DZ22K and DZ22L), non-elective inpatient – short stay

Resource Use Item	Unit	Unit cost (suggestive)	Source, definition, and assumptions
-Ward	day	£347	NHS Reference Costs 2017/18[20]: weighted average of Unspecified Acute Lower Respiratory Infection with Interventions across CC scores (currency codes DZ22K and DZ22L), excess bed-day
Rehab for Stroke	session	£416	NHS Reference Costs 2022/23[19]: rehabilitation for stroke (currency code VC04Z)

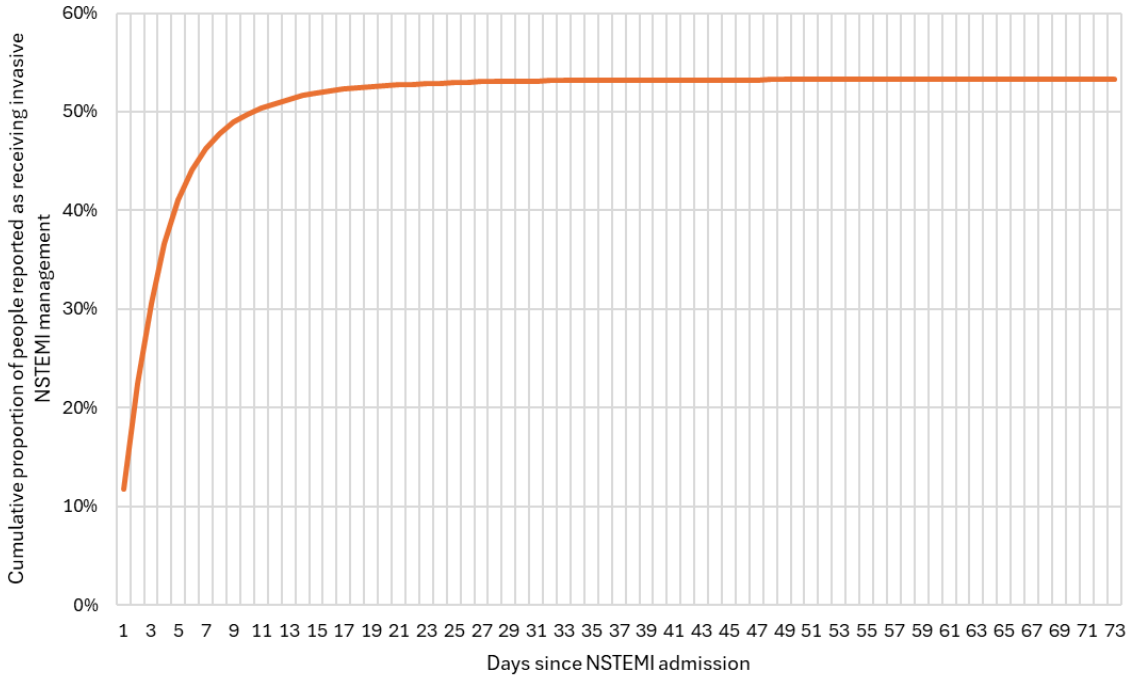
The unit costs taken from 2017/18 and 2022/23 NHS reference costs and 2022/23 PSSRU are inflated to 2023/24 prices (£) using the UK GDP deflator.

Supplementary table 6: HRQoL values identified from literature review

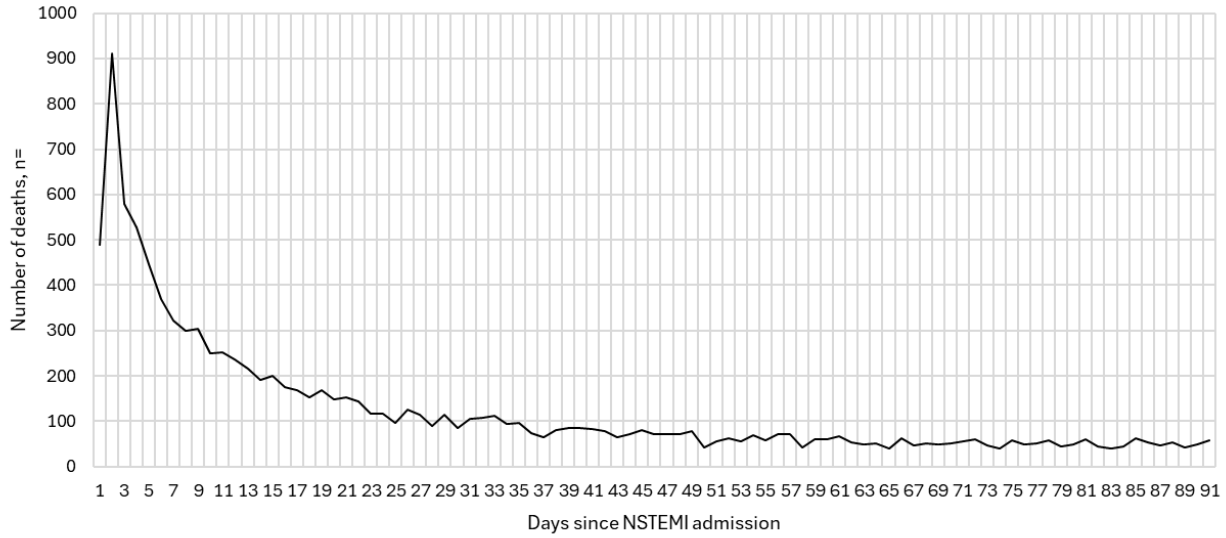
Health state	Time point	HRQoL value (suggestive)	Source	Remark
USTEMI and CKD	Baseline	Not found	NA	The multiplicative approach will be applied.
USTEMI and CKD	Discharge	Not found	NA	The multiplicative approach will be applied.
USTEMI and CKD	6 months	Not found	NA	The multiplicative approach will be applied.
USTEMI and CKD	12 months	Not found	NA	The multiplicative approach will be applied.
USTEMI	Baseline	0.71	Munyombwe, T., et al.(2020)	Cohort information: baseline age is 65.9, proportion of female is 26.6%, proportion of chronic renal failure is 4.3%.[22]
USTEMI	1 month	0.73	Munyombwe, T., et al.(2020)	Cohort information: baseline age is 65.9, proportion of female is 26.6%, proportion of chronic renal failure is 4.3%.[22]
USTEMI	6 months	0.76	Munyombwe, T., et al.(2020)	Cohort information: baseline age is 65.9, proportion of female is 26.6%, proportion of chronic renal failure is 4.3%.[22]
USTEMI	12 months	0.77	Munyombwe, T., et al.(2020)	Cohort information: baseline age is 65.9, proportion of female is 26.6%, proportion of chronic renal failure is 4.3%.[22]
CKD stage 2	Any	0.85	Cooper, J. T., et al. (2020)	The values measured by EQ-5D.[23]
CKD stage 3	Any	0.73	Cooper, J. T., et al. (2020)	The values measured by EQ-5D.[23]
CKD stage 4	Any	0.74	Cooper, J. T., et al. (2020)	The values measured by EQ-5D.[23]
CKD stage 5 without dialysis	Any	0.73	Cooper, J. T., et al. (2020)	The values measured by EQ-5D.[23]
CKD stage 5 with hemodialysis	Any	0.67	Cooper, J. T., et al. (2020)	The values measured by EQ-5D.[23]
CKD stage 5 with peritoneal dialysis	Any	0.57	Cooper, J. T., et al. (2020)	The values measured by EQ-5D.[23]

Supplementary figures

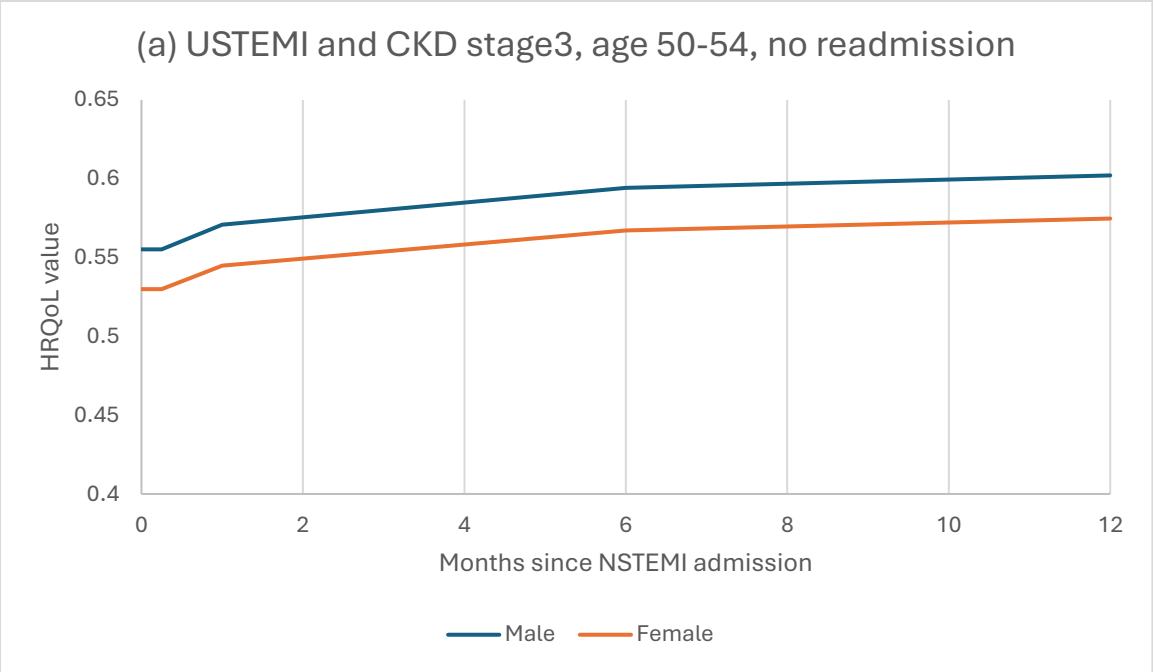
Supplementary figure 1: Cumulative proportion of people with reduced kidney function hospitalised for NSTEMI in England reported as receiving invasive NSTEMI management by day since NSTEMI admission (pilot data from NHS Health Services Commissioning data)

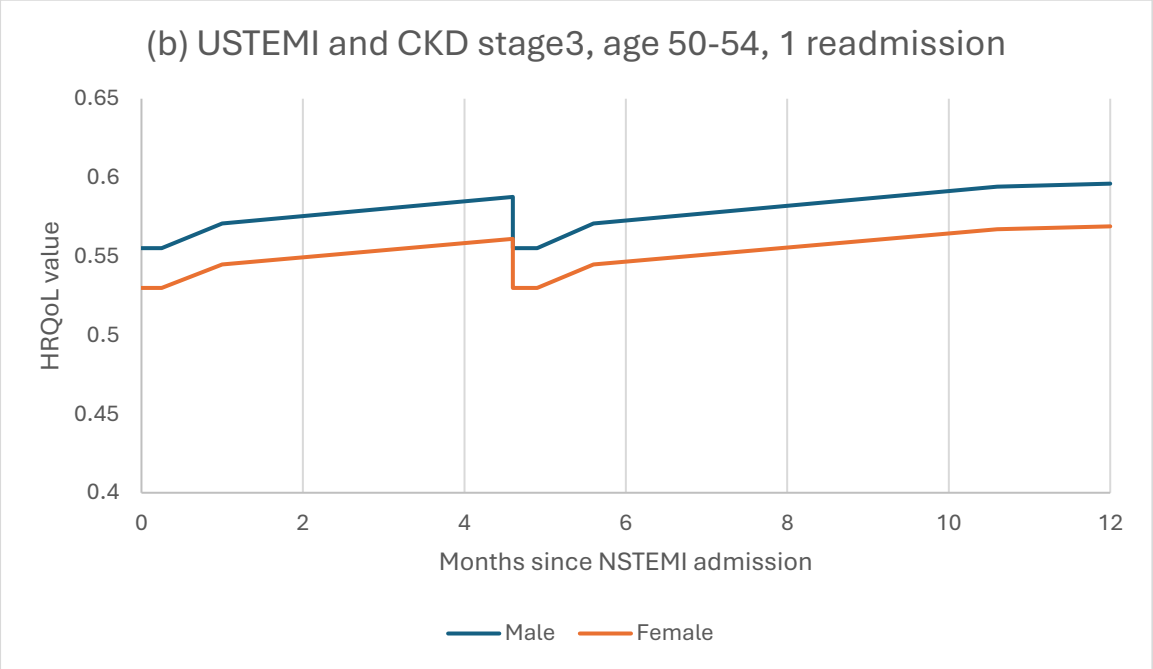


Supplementary figure 2: Daily count of deaths from 0 to 90 days follow-up among people hospitalised for NSTEMI with reduced kidney function (NHS health services commissioning data)



Supplementary figure 3: An illustrative example for patients with age in the range of 50-54 and a stage 3 CKD that compares the HRQoL of (a) those who discharges at 0.25 month and had no readmission to (b) those who readmitted to hospital at 4.6 month and discharged again at 4.9 month.





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