

Cost-utility analysis of standard dressing compared with incisional negative-pressure wound therapy among patients with closed surgical wounds following major trauma to the lower limbs

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ABSTRACT

Aim: To compare the cost-utility of standard dressing with incisional negative-pressure wound therapy (iNPWT) in adults with closed surgical wounds associated with major trauma to the lower limbs.

Patients and Methods: A within-trial economic evaluation was conducted from the UK National Health Service (NHS) and personal social services (PSS) perspective based on data collected from the Wound Healing in Surgery for Trauma (WHIST) multi-centre randomized clinical trial. Health resource utilisation was collected over a 6-month post-randomisation period using trial case report forms and participant-completed questionnaires. Cost-utility was reported in terms of incremental cost per quality-adjusted life year (QALY) gained. Sensitivity analysis was conducted to test the robustness of cost-effectiveness estimates while uncertainty was handled using confidence ellipses and cost-effectiveness acceptability curves.

Results: The incremental cost of standard dressing versus iNPWT over 6 months was £2037 (95% confidence interval (CI) £349 to £3724). There was an insignificant increment in QALYs gained in the iNPWT group (0.005, 95% CI -0.018 to 0.028). The probability of iNPWT being cost effective at £20,000 per QALY was 1.9%. The results remained robust in the sensitivity analysis.

Conclusion: The within-trial economic evaluation suggests that iNPWT is unlikely to be a cost effective alternative to standard dressing in adults with closed surgical wounds to their lower limbs.

INTRODUCTION

Lower limb fractures are common injuries which result in substantial mortality and morbidity^{1,2}. In the context of major trauma, the risk of surgical site infection is high, leading to prolonged and expensive treatment³. One of the factors that may reduce the risk of wound infection is the type of dressing applied at the completion of surgery.

Incisional negative-pressure wound therapy (iNPWT) is an alternative form of surgical site dressing which may be applied to closed surgical incisions. The dressing is composed of a silicone contact layer, an airlock layer, a superabsorbent layer and a polyurethane (semipermeable) layer on the top which makes the system waterproof while allowing water vapour to evaporate. The dressing is connected to a closed suction system which generates -80 mmHg of negative pressure on the surface of the wound. iNPWT dressings may prevent bacterial ingress, remove blood and serous fluid exuding from the wound and potentially reduce the rate of wound infection for closed surgical incisions⁴.

However, no previous study has investigated the cost-effectiveness of standard dressings versus iNPWT among patients with closed surgical wounds associated with major trauma to the lower limbs. The objective of this study is to evaluate the cost-utility of standard dressing versus iNPWT in adult patients with closed surgical wounds associated with major trauma to the lower limbs using data collected from the Wound Healing in Surgery for Trauma (WHiST) trial⁵.

PATIENTS AND METHODS

Background of trial

The protocol⁶ and main clinical results⁵ of the WHiST trial are published elsewhere. Briefly, WHiST was a UK-based multicentre, pragmatic, parallel group randomized clinical trial. Patients were eligible if they were aged 16 years and above and presented to hospital within 72 hours of major trauma, which included a lower limb fracture requiring a surgical incision. Those who had an open fracture of the lower limb that could not be closed primarily, or were unable to complete trial procedures or questionnaires were excluded. There were 763 participants randomized to the standard dressing and 785 randomized to iNPWT. Participants who were eligible and gave consent (n=1540; 99.5%) form the study population for this economic evaluation; 759 participants randomized to standard dressing and 781 randomized to iNPWT. The mean age of the patients was 49.8 years (standard deviation, SD=20.2 years) with a mean body mass index of 26.5 kg/m² (SD=5.9 kg/m²) and the majority being male (n=964; 63.7%) and were involved in a road traffic accident (n=571; 37.1%). Majority of the patient had an injury severity score of less than 16 (n=1202; 78.1%) and similar to the clinical reports, the baseline characteristics of the patients were well balanced after randomization⁵. The WHiST trial was approved by the UK National Research Ethics Committee and registered with the clinical trials registry (16/WM/0006; ISRCTN 12702354).

Collection of health resource data

Health resource use was captured using baseline and 6-week trial case report forms and included inpatient care (i.e. hospitalisation and further treatment procedures), antibiotics and the number and type of dressing changes. Since the random allocation of the type of dressing occurred at the end of the surgery, only post-surgical health and social service resources were included in the economic evaluation. Resource use related to the fracture fixation or concurrent surgery occurring before randomisation were not collected. Healthcare resources after 6 weeks, such as inpatient care, outpatient care, primary and community care, and medications were determined by means of health resource questionnaires completed by the participants (or their carer). Non-medical health resources such as aids and adaptations, personal social services (PSS), travel, childcare, help with housework, as well as lost productivity were captured in the same participant-reported health resource questionnaire. The health resource questionnaires were administered at three and six months post-randomisation, with a recall period of around three months.

The clinical results of the WHIST trial are reported up to 6 months. However, as part of our sensitivity analysis, healthcare resource related to the surgical wound was also collected at 12 months, in order to capture any late wound healing complications and further interventions for surgical site infection.

Collection of unit costs

Direct medical costs were separated into costs associated with the dressings and the costs incurred for other reasons attributable to the interventions. Unit direct medical costs associated with the interventions were obtained from the NHS Supply Chain Catalogue 2018/2019⁷ (Supplementary Table 1). The unit cost of standard dressing was assumed to be the mean unit cost of permeable or semipermeable, and non-permeable film/soft polymer dressings (e.g. OpSite, Mepore, Leukomed, Tegaderm, Cosmopor E, Softpore, Mepitel and Hydrofilm). An additional component of the intervention costs was the cost associated with dressing changes that occurred in both groups. This cost was estimated from the number of dressing changes and the time taken for a Band 5 hospital nurse to replace the dressing. The time taken to change a dressing was assumed to be five minutes for both types of dressing based on expert opinion. The cost per working hour of the nurse was obtained from the Personal Social Service Research Unit (PSSRU) 2018⁸.

There were two components to the cost of inpatient care: the cost of hospitalisation after the initial operation and the cost of further procedures that were related to the trial (e.g. debridement of the wound, metalwork removal and revision of internal fixation). These costs were derived using the NHS HRG4+ 2017/18 Reference Cost Grouper⁹ and the NHS Reference Costs 2017/18¹⁰.

Unit costs of medical items other than those directly attributable to the intervention (such as subsequent inpatient care, outpatient care, or primary and community care utilised by participant post-surgery) were sourced from the NHS Reference Costs. The unit cost of medication was sourced from the BNF¹¹ and the therapeutic classes deemed related to the trial by clinical experts included

analgesic, antibiotic, anticoagulant, antidepressant, bisphosphonate, corticosteroid, hypnotic and anxiolytic, antiemetic, supplements and vitamins.

Unit costs for direct non-medical cost items such as PSS were obtained from the PSSRU while the costs of aids and adaptations were obtained from the NHS Supply Chain Catalogue (Supplementary Table 1). The total cost per participant for additional (private) cost items incurred by participants and their next-of-kin such as travel expenditure, childcare and help with housework were obtained from the participants directly via the participant-reported questionnaires. In order to estimate indirect costs, the daily median wage was obtained from the Office for National Statistics¹² to compute the cost of lost productivity (i.e. absenteeism).

Cost per participant

Costs were calculated by multiplying resource use by the unit cost per resource and were expressed in 2017/2018 UK pounds sterling (£). Unit costs were adjusted to 2017/2018 prices using the NHS Hospital & Community Health Services index for health service resources where required⁸. No discounting of costs was applied since cost effectiveness was determined within a year.

Medication cost was computed using the unit cost per dose for each product and the mean quantity taken per day during the reported number of days. All medications were assumed to be in tablet form unless stated otherwise. If the dose of the medication was not recorded, the defined daily dose for each medication was taken from the World Health Organisation website using the relevant Anatomical Therapeutic Chemical code¹³. For the base case analysis, which is from the NHS and PSS perspective, only medications that were prescribed were included as we assumed that participants bought the medications out-of-pocket if it was bought without a prescription.

The cost of absenteeism was computed using the human capital approach where the daily median wage was multiplied by the number of days taken off work due to the injury.

Health outcomes

The primary health outcome for the economic evaluation was quality-adjusted life years (QALYs). Health-related quality of life (HRQoL) was captured using the EQ-5D-5L instrument¹⁴ at baseline (where pre- and post-injury HRQoL was measured), three and six months post-randomisation. As part of the sensitivity analysis, HRQoL was also measured using the EQ-5D-5L instrument at 12 months post-randomisation. The EQ-5D-5L has five dimensions: mobility, self-care, usual activities, pain/discomfort, and anxiety/depression, as well as five levels of severity for each dimension. Responses to the EQ-5D-5L were converted into multi-attribute utility scores comparable with those derived from the EQ-5D-3L instrument using the UK cross-walk value sets developed by van Hout et al.¹⁵. QALYs were calculated as the area under the baseline-adjusted utility curve of the EQ-5D-3L utility scores from baseline, three and six months data using the trapezoidal rule¹⁶. Since the time horizon was within a year, no discounting was required for health utilities.

Data analysis

All analysis was based on an intention-to-treat approach. Free text responses (applicable to all the “other” options) were either reclassified to the appropriate cost category; removed if deemed unrelated/ irrelevant to the trial by clinical experts, or analysed collectively as “other” in the descriptive analysis and excluded in the cost analysis. Items not listed as one of the pre-specified options were excluded from the cost analysis because the most frequently utilised resource item within each cost category would have been listed as one of the options in the questionnaire, so the exclusion of such miscellaneous items will not materially affect the findings.

Mean and standard deviation (SD) of resource use and cost values for each cost category, at each time-point, were calculated using the available case dataset (i.e. all observed data). Differences between health resource utilisation, the means of costs and utility scores were calculated and tested for statistically significant differences using t-tests. For differences in mean costs, the bootstrap 95% confidence interval (CI) was computed based on 1,000 replications. Differences in proportion of resource use between treatment groups were examined using chi-square tests.

Cost-utility analysis

An incremental cost-utility analysis comparing the cost effectiveness of standard dressing and iNPWT was computed in terms of incremental mean cost per mean QALY gained and expressed using incremental cost-effectiveness ratios (ICERs). In the base case analysis, the NHS and PSS perspective was adopted and analysis was based on imputed and covariate-adjusted trial data. Cost categories included in the NHS and PSS perspective were the cost of intervention, inpatient care, outpatient care, community care, medications bought with prescription, PSS, as well as aids and adaptations.

Uncertainty related to the ICER was presented using confidence ellipses and cost-effectiveness acceptability curves (CEACs), which indicate the probability that iNPWT is cost effective at varying levels of willingness-to-pay for an additional QALY gained, were generated via non-parametric bootstrapping with 1,000 replicas. The ICER was compared to willingness-to-pay thresholds of £20,000 and £30,000 per QALY, which are commonly applied in the UK by bodies such as NICE¹⁷. An additional £15,000 cost-effectiveness threshold was also included to reflect recent trends in healthcare decision making¹⁸. The net monetary benefit (NMB) of standard dressing versus iNPWT was also computed and presented in a graph across different cost-effectiveness thresholds where a positive incremental NMB indicated that iNPWT is cost effective compared with standard dressing at the given cost-effectiveness threshold.

Missing data

Under the missing at random assumption, mean imputation was used for missing baseline covariates,¹⁹ while multiple imputation by chained equation (MICE) was implemented for missing cost and QALYs in order to produce unbiased estimates of costs and health outcomes. This assumption was tested using logistic regressions of missing-ness of costs and QALYs against baseline covariates.

Inverse probability weighting was not adopted as our data was non-monotonic (i.e. participants who did not complete the 3-month questionnaire could have completed the 6-month questionnaire).

Multiple imputation for QALYs was done at the score level while costs were imputed at the total cost level in each follow-up time-point. Independent variables included in the imputation model consisted of baseline EQ-5D score, whether the fracture was open or closed at presentation, age at randomisation, smoking, education, and employment status. The imputation was run 60 times in line with a 'rule of thumb' suggesting that the number of imputations should be similar to the percentage of incomplete cases²⁰. A seemingly unrelated regression model was fitted to the imputed data to estimate total costs and total QALYs in each treatment group over the 6-month follow-up period. This approach allows for correlation between costs and outcomes and estimates the two regression equations jointly, potentially improving the precision of the estimates. Estimates obtained from each imputed dataset were then combined using Rubin's rules¹⁹ to obtain an overall mean estimate of the costs or QALYs.

Sensitivity analysis

Alongside the probabilistic sensitivity analysis described above, several deterministic sensitivity analyses were conducted to explore the effects of alternative perspectives or scenarios on the cost-effectiveness results. First, a longer-term (12-months) difference in EQ-5D and health resource utilisation between the treatment groups was examined as wound complications attributable to the treatments could occur beyond the six months period. Second, a societal perspective that included medications bought out-of-pocket, additional (private) costs incurred by participants and next-of-kin as well as cost of absenteeism from work was considered. Lastly, a complete case analysis was performed, where only participants with completed data on all cost and outcome data at all follow-up time-points were included, after adjusting for the covariates.

RESULTS

Completion rate

Among the 1540 participants who completed the baseline, 1220 (79.2%) completed the 3-month health resource questionnaire (590 in standard dressing group and 630 in iNPWT group) while 1319 (85.6%) completed the 6-month health resource questionnaire (647 in standard dressing group and 672 in iNPWT group).

Health resource use

Table 1 shows the health resource use for participants at each time-point by treatment group based on the available case dataset (results from the complete case dataset is not shown here as it is similar and does not change the interpretation of the results).

Between discharge and three months post-randomisation, there were no statistically significant differences in resource use between the treatment groups in any health resource category, except

for the number of dressing changes and the number of inpatient episodes related to further orthopaedic surgery to the injured leg. Participants randomized to the standard dressing had more frequent dressing changes than those in the iNPWT group (t-test, $p<0.001$). The mean length of inpatient stay during the first three months after discharge due to the need for 'further orthopaedic surgery to the injured leg' was significantly longer in the iNPWT group (0.97 days; SD=7.00 days) than that of the standard dressing group (0.24 days; SD=2.25 days; t-test, $p=0.02$). This difference was driven by a small number of participants having extended inpatient stays in the iNPWT group ($n=29$; range = 0 to 105 days) compared with the standard dressing group ($n=11$; range = 0 to 42 days). If log-transformation were performed before the t-test to account for positive skewness in the length of stay, this difference becomes insignificant ($p=0.09$).

There were also no statistically significant differences in treatments of wound complications at 12 months post-randomisation as depicted in Table 2 (chi-square test, $p>0.05$) from the sensitivity analysis. Since there were no statistically significant differences in the treatments of wound complications at 12 months, the difference in healthcare costs beyond 6-months was not analysed.

Healthcare costs

The mean costs of the key resource inputs associated with the trial using the available case dataset and the sensitivity analysis, where the societal perspective was considered, from baseline to 6 months are summarised in Table 3.

In terms of the absolute cost from baseline to six months, the main cost driver was the initial intervention and it consisted of the cost of the dressing, orthotic/cast, initial inpatient care (i.e. hospitalisation and further surgery), antibiotics and dressing changes. The mean cost for initial intervention cost was £4774 for standard dressing and £5421 for iNPWT; mean cost was £647 higher in iNPWT than standard dressing (t-test, $p=0.01$, 95%CI £141 to £1166). In terms of relative differences in mean cost from baseline to six months, the mean cost of subsequent inpatient care (or readmission) was £1126 significantly higher in iNPWT compared to standard dressing (t-test, $p=0.04$, 95%CI £102 to £2251).

Health outcomes

The summary statistics of the EQ-5D visual analogue scale (VAS) and EQ-5D utility scores for available cases across all time-points by treatment groups is presented in Table 4. There was no difference in the EQ-5D VAS; the EQ-5D utility between treatment groups at any time-point and the mean QALYs of standard dressing (0.41, SD=0.24) were not statistically significant from that of iNPWT (0.40, SD=0.22; t-test, $p=0.49$) between baseline and six months post-randomisation. In the sensitivity analysis, the mean QALYs of standard dressing (0.51, SD=0.24) were not statistically significantly different from those of iNPWT (0.50, SD=0.23; t-test, $p=0.31$) between baseline and 12 months post-randomisation.

Cost-utility analysis

The base case analysis produced an ICER of £396,531 per QALY gained from the NHS and PSS perspective (Table 5). Based on the assumed cost-effectiveness thresholds of £15,000, £20,000 and £30,000 per QALY, the probability of iNPWT being cost effective relative to standard dressing ranged from 0.015 to 0.028 and its NMB was negative (Figure 1). Therefore, iNPWT is highly unlikely to be cost effective in the studied population. The sensitivity analyses undertaken (i.e. societal perspective and complete case analysis) did not materially change this finding (Supplementary Figures 1 and 2 respectively).

DISCUSSION

This study shows that the use of iNPWT is highly unlikely to be cost effective among patients with a closed surgical incision for major trauma of the lower limb under commonly assumed thresholds. This conclusion is driven by the substantially higher costs (£2037, 95% confidence interval (CI) £349 to £3724) of iNPWT per participant compared to standard dressing from the NHS and PSS perspective and the lack of meaningful difference in QALYs observed between the groups.

There were only two statistically significant differences in resource use from baseline to 12 months post-randomisation. First, the number of dressing changes was higher in the standard dressing group (t-test, $p < 0.001$). However, given that the unit cost of iNPWT is almost a hundred times higher than that of the standard dressing, this did not make a significant difference to the overall cost. Second, the length of unplanned readmissions for orthopaedic surgery to the injured leg among a small number of participants in the first three months since randomisation was higher in the iNPWT group (t-test, $p = 0.02$). While it is possible that the type of wound dressing may have altered the rate of surgical site infection and led to a difference in readmission for wound healing complications, the recorded readmissions were actually for revision orthopaedic surgery to the injured limb (i.e. for failure of fixation or to promote fracture union). Therefore, it seemed very unlikely that these readmissions were related to the type of wound dressing applied i.e. this difference is most likely due to chance.

To our knowledge, this study is the first economic evaluation to compare the cost effectiveness of iNPWT and standard dressing among patients with closed surgical incision for major trauma of the lower limb. The strengths of this study relate to the adopted comprehensive assessment of health and social care services resource usage and the disaggregated presentation of the results. However, this study is not without limitations. There were some missing data at six months post-randomisation and this may limit the internal validity of the study. This was explored in the complete case analysis and the results were consistent with the base case analysis. Furthermore, PSS was not collected to inform the health utilisation pattern between six and twelve months post-randomisation. However, since direct medical cost was the main cost driver in this trial and there were no significant differences in health utilities between the treatment groups at 6-month or 12-month time-point, the differences in PSS utilisation and costs between the groups beyond six months until twelve months post-randomisation are very unlikely to be sufficiently significant to change the conclusions.

In conclusion, this study provides robust evidence that iNPWT is unlikely to be cost effective compared to standard dressing in patients with closed surgical incisions for major trauma of the lower limb under commonly assumed thresholds.

TAKE HOME MESSAGE

- iNPWT costs more than standard dressing yet there is no meaningful difference in QALYs observed between the treatments.
- iNPWT is highly unlikely to be cost effective in the patients with closed surgical incision for major trauma of the lower limb under commonly assumed thresholds.

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TABLES

Table 1. Health resource use by follow-up time-points and treatment groups

Resource items	Standard dressing		iNPWT		p-value
Baseline to discharge					
Hospitalisation, mean LoS in days (SD)					
Intensive care	0.76	(2.96)	1.05	(4.53)	0.14
Acute trauma	10.92	(9.73)	11.74	(10.59)	0.12
Rehabilitation	1.23	(6.00)	1.16	(4.82)	0.81
Other	6.72	(9.14)	12.64	(15.95)	0.10
Antibiotic (other than prophylactic antibiotics), proportion of participants	0.07		0.06		0.32
Dressing change to, mean number (SD)					
Standard	0.79	(1.14)	0.62	(0.82)	<0.001
iNPWT	0.05	(0.34)	0.21	(0.68)	<0.001
Discharge to 3 months					
Subsequent inpatient care, mean number of days (SD)					
Orthopaedics (leg)	0.24	(2.25)	0.97	(7.00)	0.02
Orthopaedics (other bones)	0.05	(0.59)	0.13	(1.38)	0.23
Rehabilitation unit	0.37	(3.58)	0.74	(5.25)	0.19
Other surgery	0.01	(0.19)	0.10	(1.06)	0.06
Other non-surgery	0.15	(1.73)	0.30	(4.72)	0.48
Outpatient care, mean number of visits (SD)					
Orthopaedics	1.81	(1.69)	1.75	(1.70)	0.60
Pathology	0.09	(0.42)	0.15	(1.17)	0.25
Radiology	1.19	(1.43)	1.12	(1.35)	0.42
Physiotherapy (NHS)	1.88	(4.81)	1.80	(3.27)	0.76
Physiotherapy (private)	0.68	(4.27)	0.50	(2.00)	0.40
Emergency department (related to fracture or wound)	0.05	(0.28)	0.05	(0.28)	0.74
Emergency department (any other reason)	0.05	(0.33)	0.03	(0.20)	0.18
Other	0.18	(1.18)	0.12	(0.62)	0.28
Community care, mean duration* (SD)					
GP surgery consultation	6.69	(29.35)	7.91	(32.48)	0.53
GP home visit	2.00	(11.36)	1.14	(6.51)	0.15
GP telephone call	1.63	(6.69)	2.02	(12.28)	0.52
Practice nurse	3.30	(19.17)	7.48	(90.27)	0.30
District nurse	11.00	(71.74)	11.26	(44.19)	0.95
Community physiotherapy	31.82	(145.85)	24.01	(115.15)	0.35
Calls to NHS Direct (or NHS 111)	0.05	(0.32)	0.07	(1.10)	0.64
Calls for an ambulance or paramedic	0.07	(0.61)	0.02	(0.22)	0.12
Occupational therapy	3.35	(29.30)	7.79	(60.34)	0.13
Other	7.27	(149.89)	1.76	(26.25)	0.17
Medications, proportion of participants					
At least one type prescribed	0.27		0.31		0.85
Personal social services, mean duration* (SD)					
Meal-on-wheels (frozen, daily)	0.00	(0.00)	0.14	(3.22)	0.32
Meal-on-wheels (hot, daily)	0.03	(0.64)	0.00	(0.00)	0.29
Laundry services	0.02	(0.25)	0.05	(1.04)	0.54
Social worker	3.17	(34.03)	0.54	(6.82)	0.10
Care worker/home help	89.96	(661.58)	237.62	(1899.64)	0.09

Resource items	Standard dressing		iNPWT		p-value
Other	2.58	(46.79)	11.09	(325.46)	0.40
Aids and adaptations, mean number (SD)					
Crutch	0.98	(1.01)	1.05	(1.02)	0.32
Stick	0.19	(0.49)	0.15	(0.45)	0.26
Zimmer frame	0.30	(0.52)	0.35	(0.58)	0.15
Grab rail	0.18	(0.56)	0.14	(0.45)	0.29
Dressing aid	0.11	(0.63)	0.21	(1.55)	0.18
Long-handle shoe horn	0.06	(0.25)	0.08	(0.28)	0.23
Other	0.20	(0.44)	0.21	(0.48)	0.55
Additional cost [†] , proportion of participants	0.33		0.38		0.59
Time off, mean number of days (SD)					
Days off work	54.03	(42.41)	58.11	(42.68)	0.23
3 months to 6 months					
Subsequent inpatient care, mean number of days (SD)					
Orthopaedics (leg)	0.43	(3.42)	0.32	(2.57)	0.60
Orthopaedics (other bones)	0.01	(0.11)	0.09	(1.01)	0.06
Rehabilitation unit	0.27	(5.25)	0.38	(5.50)	0.76
Other surgery	0.07	(0.84)	0.10	(1.40)	0.70
Other non-surgery	0.04	(0.51)	0.12	(1.52)	0.28
Outpatient care, mean number of visits (SD)					
Orthopaedics	1.01	(1.45)	1.19	(1.67)	0.07
Pathology	0.12	(0.52)	0.14	(0.55)	0.54
Radiology	0.62	(1.09)	0.75	(1.22)	0.08
Physiotherapy (NHS)	2.51	(5.67)	2.01	(4.06)	0.13
Physiotherapy (private)	0.57	(2.69)	0.69	(2.89)	0.53
Emergency department (related to fracture or wound)	0.04	(0.26)	0.03	(0.20)	0.64
Emergency department (any other reason)	0.03	(0.22)	0.02	(0.21)	0.53
Other	0.19	(1.24)	0.16	(0.92)	0.72
Community care, mean duration* (SD)					
GP surgery consultation	6.98	(44.92)	6.53	(24.62)	0.85
GP home visit	0.52	(3.75)	0.73	(4.94)	0.47
GP telephone call	1.49	(9.01)	1.12	(9.02)	0.53
Practice nurse	7.44	(127.88)	1.97	(13.07)	0.37
District nurse	5.49	(73.25)	5.97	(48.40)	0.91
Community physiotherapy	23.96	(106.09)	18.85	(79.23)	0.41
Calls to NHS Direct (or NHS 111)	0.04	(0.50)	0.03	(0.39)	0.87
Calls for an ambulance or paramedic	0.03	(0.23)	0.02	(0.16)	0.43
Occupational therapy	3.84	(40.85)	3.91	(28.98)	0.97
Other	1.48	(28.20)	1.67	(21.13)	0.84
Medications, proportion of participants					
Prescribed	0.15		0.17		0.50
Personal social services, mean duration* (SD)					
Meal-on-wheels (frozen, daily)	0.00	(0.05)	0.10	(2.27)	0.33
Meal-on-wheels (hot, daily)	0.00	(0.00)	0.00	(0.00)	-
Laundry services	0.03	(0.57)	0.00	(0.00)	0.32
Social worker	0.93	(10.91)	4.97	(68.90)	0.20
Care worker/home help	212.87	(2501.19)	50.54	(543.76)	0.18
Other	6.19	(145.73)	16.16	(374.10)	0.44
Aids and adaptations, mean count (SD)					

Resource items	Standard dressing		iNPWT		p-value
Crutch	0.27	(0.78)	0.32	(0.74)	0.34
Stick	0.14	(0.41)	0.12	(0.40)	0.58
Zimmer frame	0.10	(0.33)	0.10	(0.35)	0.90
Grab rail	0.11	(0.53)	0.13	(0.65)	0.60
Dressing aid	0.03	(0.22)	0.05	(0.52)	0.34
Long-handle shoe horn	0.04	(0.20)	0.04	(0.20)	0.91
Other	0.06	(0.32)	0.06	(0.27)	0.80
Additional cost [†] , proportion of participants	0.20		0.28		0.01
Time off, mean number of days (SD)					
Days off work	40.46	(56.71)	48.95	(60.00)	0.10

* Duration, in minutes = number of contacts in the last 3 months x average duration of contacts (minutes)

† Additional cost refers to additional (private) cost items incurred by participants and their next-of-kin (e.g. travel expenditure, childcare, and help with housework)

LoS = Length of stay, SD = standard deviation

Table 2. Resource use due to wound complications at 12 months post-randomisation

Question label	Standard dressing (n=401)		iNPWT (n=441)		p-value
	No.	%	No.	%	
Problems with the healing of wound in the last 6 months					0.611
No	363	90.5	392	88.9	
Yes	37	9.2	45	10.2	
Unknown	1	0.2	4	0.9	
Given antibiotics for a problem with the wound in the last 6 months					0.569
No	379	94.5	411	93.2	
Yes	21	5.2	27	6.1	
Unknown	1	0.2	3	0.7	
Had surgery under general anaesthetic for treatment of a problem with the wound in the last 6 months					0.150
No	377	94.0	422	95.7	
Yes	23	5.7	16	3.6	
Unknown	1	0.2	3	0.7	
Had further surgery because of the fracture in the last 6 months					0.125
No	373	93.0	392	88.9	
Yes	27	6.7	42	9.5	
Unknown	1	0.2	3	0.7	
Had other complications from the fracture or surgery in the last 6 months					0.485
No	292	72.8	329	74.6	
Yes	108	26.9	109	24.7	
Unknown	1	0.2	3	0.7	

Table 3. Mean costs (SD) by treatment group from baseline to six months, in 2017/2018 prices

Cost category	Standard dressing (£)		iNPWT (£)		Mean difference (£)	p-value	Bootstrap 95%CI		
Baseline to six months									
Initial intervention cost*	4774.15	(4633.18)	5420.66	(5559.95)	646.51	0.01	140.49	to	1166.10
Subsequent inpatient care	982.54	(7447.93)	2108.42	(13436.28)	1125.88	0.04	102.12	to	2250.52
Outpatient care	413.34	(549.43)	434.89	(526.62)	21.55	0.43	-30.27	to	75.08
Community care	97.16	(299.49)	96.28	(257.75)	-0.89	0.95	-29.05	to	26.39
Medications	15.39	(125.25)	13.28	(73.26)	-2.11	0.69	-13.22	to	7.20
Personal social services	86.53	(925.35)	95.32	(779.62)	8.78	0.84	-81.63	to	89.24
Aids and adaptations	90.92	(1303.61)	53.01	(231.36)	-37.91	0.43	-147.05	to	28.63
Total cost, NHS and PSS	6460.05	(9521.96)	8221.87	(1523.65)	1761.81	<0.001	535.64	to	3054.11
Medications (out-of-pocket)	15.39	(125.25)	13.28	(73.26)	-2.11	0.69	-13.22	to	7.20
Additional cost [†]	263.29	(1623.61)	316.82	(1478.76)	53.53	0.50	-106.04	to	202.97
Productivity loss	1704.96	(9922.39)	1650.04	(4671.19)	-54.91	0.89	-930.24	to	614.89
Total cost, societal	8443.70	(14266.17)	10202.01	(16285.05)	1758.32	<0.001	268.31	to	3344.51

* Initial intervention cost = intervention cost (dressing + orthotic cast) + inpatient care (hospitalisation + further surgery) + antibiotics + dressing change

[†] Additional cost refers to additional (private) cost items incurred by participants and their next-of-kin (e.g. travel expenditure, childcare, and help with housework)

Table 4. Mean (SD) of EQ-5D VAS and utility scores by follow-up time-points and treatment group

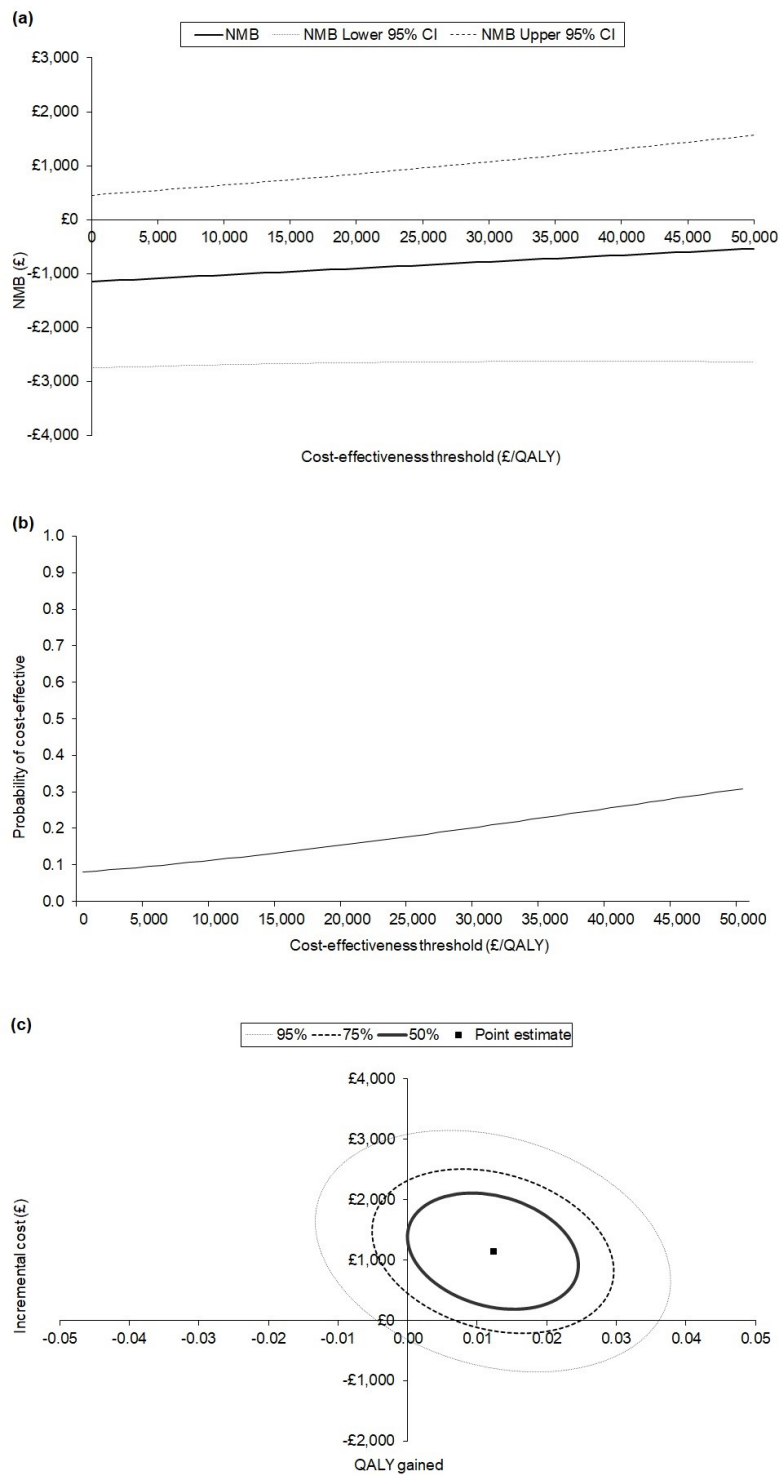
	EQ-5D VAS			EQ-5D score		
	Standard	iNPWT	p-value	Standard	iNPWT	p-value
Pre-injury	80.2 (19.2)	79.7 (19.8)	0.65	0.83 (0.24)	0.84 (0.24)	0.89
Post-injury	41.8 (24.7)	43.1 (24.1)	0.29	0.04 (0.31)	0.01 (0.29)	0.09
3 months	64.8 (22.7)	64.2 (22.2)	0.67	0.49 (0.30)	0.50 (0.29)	0.92
6 months	69.5 (21.7)	69.7 (21.2)	0.89	0.58 (0.29)	0.57 (0.29)	0.89
12 months	71.0 (22.9)	70.4 (22.5)	0.68	0.59 (0.30)	0.59 (0.30)	0.72

Table 5. Incremental cost-effectiveness of standard dressing relative to iNPWT

	Incremental cost (£) (95% CI)	Incremental QALYs (95% CI)	ICER (£/QALY)	Probability of cost-effectiveness (willingness-to-pay threshold)		
				£15,000 per QALY	£20,000 per QALY	£30,000 per QALY
Base case analysis						
NHS and PSS perspective: Imputed costs and QALYs, covariate adjusted	2,037 (349 to 3,724)	0.005 (-0.018 to 0.028)	396,531	0.015	0.019	0.028
Sensitivity analysis						
(I) Societal perspective: Imputed costs and QALYs, covariate adjusted	1,794 (-448 to 4,036)	0.003 (-0.022 to 0.027)	679,482	0.071	0.077	0.090
(II) NHS and PSS perspective: Complete case costs and QALYs, covariate adjusted	1,065 (-654 to 2,784)	0.002 (-0.026 to 0.031)	454,903	0.14	0.15	0.17

FIGURES

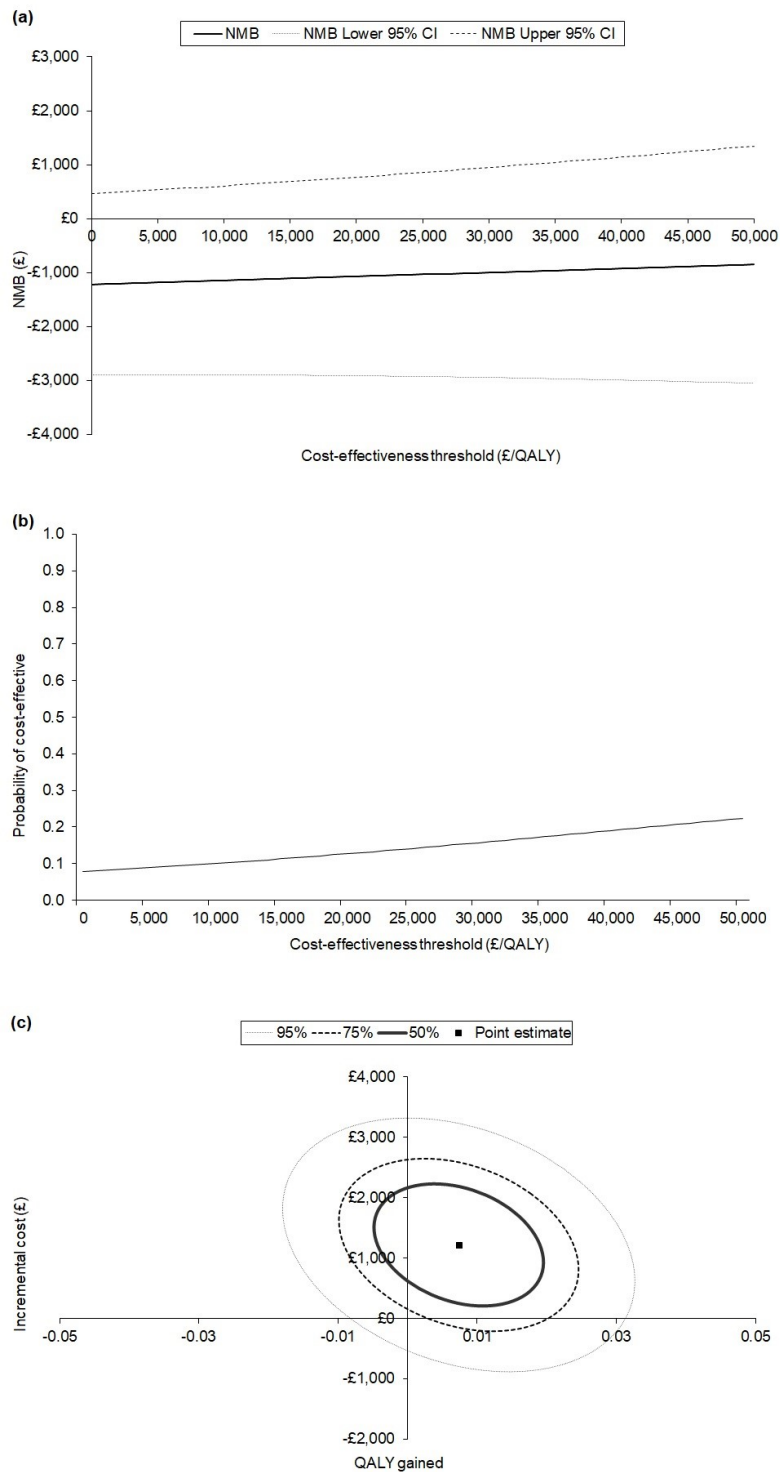
Figure 1. Base-case analysis of iNPWT versus standard dressing. (a) NMB; (b) Cost-effectiveness acceptability curve; and (c) confidence ellipse on the cost-effectiveness plane.



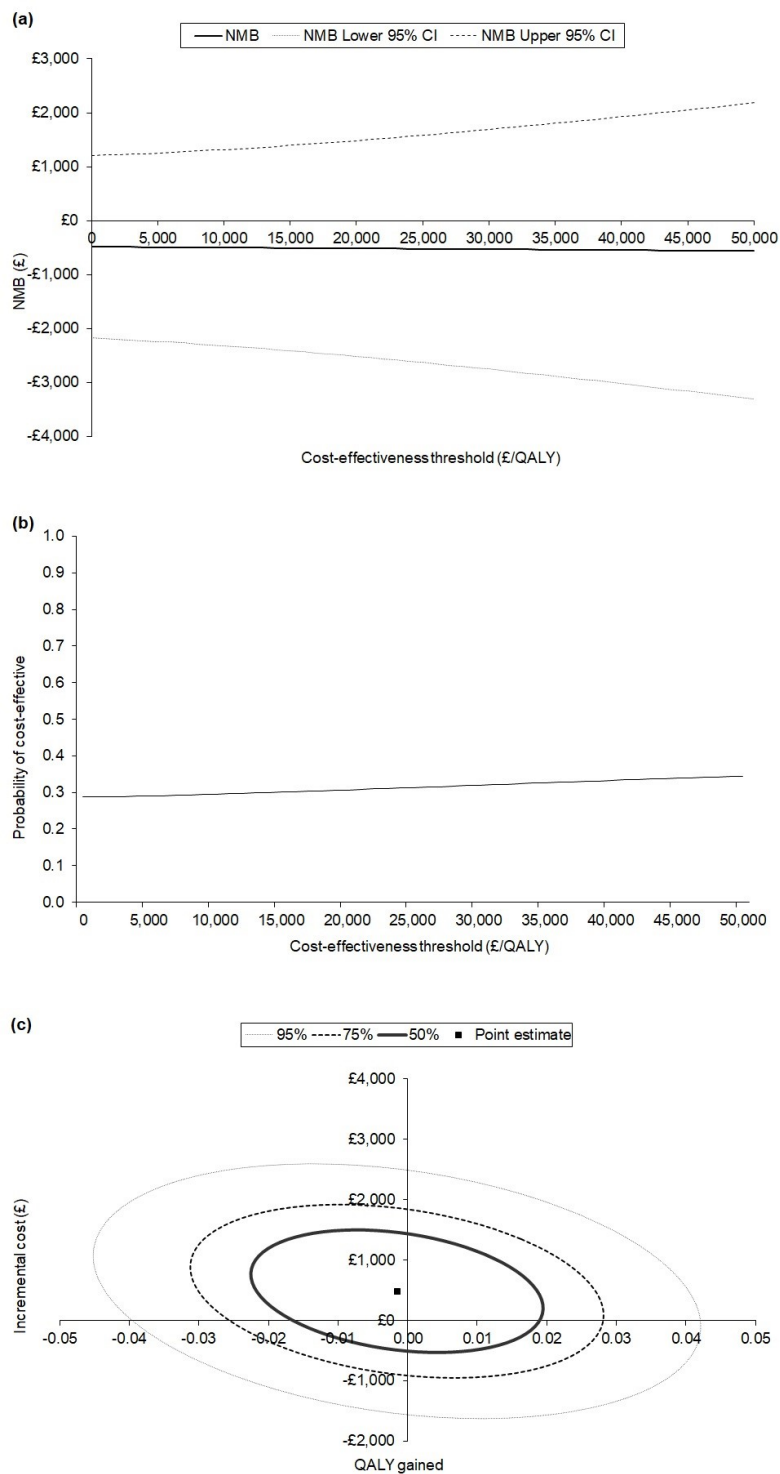
SUPPLEMENTARY MATERIAL

FIGURES

Supplementary Figure 1. Sensitivity analysis (societal perspective) of iNPWT vs. standard dressing. (a) Net monetary benefit (NMB); (b) Cost-effectiveness acceptability curve (CEAC); and (c) confidence ellipse on the cost-effectiveness plane.



Supplementary Figure 2. Sensitivity analysis (complete case) of iNPWT vs. standard dressing. (a) Net monetary benefit (NMB); (b) Cost-effectiveness acceptability curve (CEAC); and (c) confidence ellipse on the cost-effectiveness plane.



TABLES

Table 1. Summary of unit cost (in 2017/2018 £)

Resource item	Type	Unit type	Unit cost (£)	Source
Direct medical cost associated with trial				
Wound management	Negative-pressure weight therapy	each	149.52	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Standard dressing	each	1.87	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Band 5 nurse	hour	37	PSSRU 2018 p. 157
	Back slab cast	each	3.31	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Full cast	each	3.54	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Air boot/cast	each	68.66	NHS Supply Chain Catalogue Jan 2019 (average) ¹
Hospitalisation	Intensive care	per session	759	NHS Reference Costs 2017/18: XC07Z (CCU02) ²
	Acute trauma	per day	346	NHS Reference Costs 2017/18 report p. 5 ²
	Rehabilitation	per session	374	NHS Reference Costs 2017/18: VC36Z ²
Antibiotics	Amoxicillin 500mg	pack of 21	1.11	BNF Jan 2019 ³
	Ceftriaxone 2000mg	pack of 1	19.18	BNF Jan 2019 ³
	Cefuroxime 1500mg	pack of 1	4.70	BNF Jan 2019 ³
	Chloramphenicol 1%	pack of 4	2.02	BNF Jan 2019 ³
	Ciprofloxacin 400mg	pack of 10	10.00	BNF Jan 2019 ³
	Ciprofloxacin 500mg	pack of 10	0.93	BNF Jan 2019 ³
	Ciprofloxacin 750mg	pack of 10	8.00	BNF Jan 2019 ³
	Clarithromycin 250mg	pack of 14	1.18	BNF Jan 2019 ³
	Clarithromycin 500mg	pack of 7	6.72	BNF Jan 2019 ³

Resource item	Type	Unit type	Unit cost (£)	Source
	Clindamycin 150mg	pack of 24	3.90	BNF Jan 2019 ³
	Clindamycin 300mg	pack of 5	29.50	BNF Jan 2019 ³
	Co-amoxiclav 250mg	pack of 21	1.77	BNF Jan 2019 ³
	Co-amoxiclav 500mg	pack of 21	2.05	BNF Jan 2019 ³
	Co-amoxiclav 625mg	pack of 21	2.05	BNF Jan 2019 ³
	Co-amoxiclav 1000mg	pack of 10	27.50	BNF Jan 2019 ³
	Co-amoxiclav 1200mg	pack of 10	10.60	BNF Jan 2019 ³
	Daptomycin 500mg	pack of 1	88.57	BNF Jan 2019 ³
	Dicloxacillin 500mg	pack of 1	0.81*	MSH 2015 ⁴ (£1:US\$1.5618)
	Doxycycline 100mg	pack of 8	0.76	BNF Jan 2019 ³
	Flucloxacillin 250mg	pack of 28	1.08	BNF Jan 2019 ³
	Flucloxacillin 500mg	pack of 28	2.01	BNF Jan 2019 ³
	Flucloxacillin 1000mg	pack of 10	49.00	BNF Jan 2019 ³
	Flucloxacillin 2000mg	pack of 1	6.00	BNF Jan 2019 ³
	Fucidin 250mg	pack of 10	6.02	BNF Jan 2019 ³
	Gentamicin 80mg	pack of 20	40.17	BNF Jan 2019 ³
	Gentamicin 240mg	pack of 20	122.58	BNF Jan 2019 ³
	Gentamicin 360mg	pack of 20	174.07	BNF Jan 2019 ³
	Lymecycline 408mg	pack of 28	4.22	BNF Jan 2019 ³
	Meropenem 500mg	pack of 10	84.70	BNF Jan 2019 ³
	Meropenem 1000mg	pack of 10	169.30	BNF Jan 2019 ³
	Metronidazole 400mg	pack of 21	2.44	BNF Jan 2019 ³
	Metronidazole 500mg	pack of 21	38.39	BNF Jan 2019 ³
	Phenoxymethylpenicillin 250mg	pack of 28	0.90	BNF Jan 2019 ³
	Rifampicin 300mg	pack of 100	123.89	BNF Jan 2019 ³
	Rifampicin 600mg	pack of 1	9.20	BNF Jan 2019 ³
	Teicoplanin 400mg	pack of 1	7.32	BNF Jan 2019 ³
	Vancomycin 1000mg	pack of 1	11.25	BNF Jan 2019 ³

Resource item	Type	Unit type	Unit cost (£)	Source
	Tazocin 4g/500mg	pack of 10	15.75	BNF Jan 2019 ³
Other direct medical cost				
Subsequent inpatient care	Orthopaedics: leg	LoS of 1 day	2004	NHS Reference Costs 2017/18: HN25A ²
	Orthopaedics: other bones	LoS of 4 days	2990	NHS Reference Costs 2017/18: HN93Z ²
		per excess bed-day	365	NHS Reference Costs 2017/18: HN93Z ²
	Rehabilitation unit	per session	374	NHS Reference Costs 2017/18: VC36Z ²
Outpatient care	Orthopaedics	per session	124	NHS Reference Costs 2017/18: 110 ²
	Physiotherapist (NHS)	per hour	38.53*	PSSRU 2015 p. 217 ⁵
	Physiotherapist (private)	per hour	75	The Physio Centre website ⁶
	Pathology (blood tests)	per test	2.51	NHS Reference Costs 2017/18: DAPS05 ²
	Radiology (x-rays)	per test	31.49	NHS Reference Costs 2017/18: DAPF ²
	Emergency department: fracture or wound	per session	136	NHS Reference Costs 2017/18: 180 ²
	Emergency department: others	per session	136	NHS Reference Costs 2017/18: 180 ²
Community care	GP surgery	per minute	4	PSSRU 2018 p. 127 ⁷
	GP home visit	per minute	5.25*	PSSRU 2010 p. 167 ⁷
	GP phone call	7.1 minutes	27.38*	PSSRU 2015 p. 177 ⁷
	Practice nurse	per hour	42	PSSRU 2018 p. 125 ⁷
	District nurse	per hour	50.70*	PSSRU 2015 p. 169 ⁵
	Physiotherapist	per hour	36.83*	PSSRU 2014 p. 179 ⁸
	Occupational therapist	per hour	47	PSSRU 2018 p. 142 ⁷
	Calls to NHS 111	per call	14	Financial Times 2017 ⁹
	Calls for ambulance or paramedic	per call	7	PSSRU 2018 p. 89 ⁷

Resource item	Type	Unit type	Unit cost (£)	Source
Medication				
Analgesic	Algesal cream 50g	each	2.98	PCA Oct 2018 ¹⁰
	Aspirin 75mg	pack of 28	0.61	BNF Jan 2019 ³
	Co-codamol 8mg/500mg	pack of 100	2.63	BNF Jan 2019 ³
	Co-codamol 30mg/500mg	pack of 100	4.03	BNF Jan 2019 ³
	Solpadeine 12.8mg/500mg	pack of 100	3.57	BNF Jan 2019 ³
	Codeine 15mg	pack of 28	0.79	BNF Jan 2019 ³
	Codeine 30mg	pack of 28	0.94	BNF Jan 2019 ³
	Codeine 60mg	pack of 28	1.63	BNF Jan 2019 ³
	Co-dydramol 10mg/500mg	pack of 30	0.75	BNF Jan 2019 ³
	Diclofenac 50mg	pack of 28	7.41	BNF Jan 2019 ³
	Voltarol 100mg	pack of 10	3.64	BNF Jan 2019 ³
	Dihydrocodeine 30mg	pack of 28	0.93	BNF Jan 2019 ³
	Fentanyl 25mcg/hour	pack of 5	17.99	BNF Jan 2019 ³
	Gabapentin 100mg	pack of 100	2.13	BNF Jan 2019 ³
	Gabapentin 300mg	pack of 100	4.86	BNF Jan 2019 ³
	Gabapentin 600mg	pack of 100	7.25	BNF Jan 2019 ³
	Ibuprofen 200mg	pack of 24	0.93	BNF Jan 2019 ³
	Ibuprofen 400mg	pack of 24	0.80	BNF Jan 2019 ³
	Ibuprofen 600mg	pack of 84	4.07	BNF Jan 2019 ³
	Naproxen 250mg	pack of 56	2.46	BNF Jan 2019 ³
	Naproxen 500mg	pack of 56	5.19	BNF Jan 2019 ³
	Buprenorphine 5mcg/hour	pack of 4	17.60	BNF Jan 2019 ³
	Buprenorphine 10mcg/hour	pack of 4	31.55	BNF Jan 2019 ³
	Buprenorphine 15mcg/hour	pack of 4	49.15	BNF Jan 2019 ³
	Meptazinol 200mg	pack of 112	22.11	BNF Jan 2019 ³
	Methadone 5mg	pack of 50	2.84	BNF Jan 2019 ³
	Methadone 30mg	pack of 50	139.62	PCA Oct 2018 ¹⁰
	Morphine 5mg	pack of 60	3.29	BNF Jan 2019 ³

Resource item	Type	Unit type	Unit cost (£)	Source
Antibiotic	Morphine 10mg	pack of 60	5.20	BNF Jan 2019 ³
	Morphine 15mg	pack of 60	9.10	BNF Jan 2019 ³
	Morphine 20mg	pack of 56	10.61	BNF Jan 2019 ³
	Morphine 30mg	pack of 60	12.47	BNF Jan 2019 ³
	Morphine 60mg	pack of 60	24.32	BNF Jan 2019 ³
	Morphine 10mg/1ml	pack of 10	9.36	BNF Jan 2019 ³
	Zomorph 30mg	pack of 60	8.30	BNF Jan 2019 ³
	Zomorph 60mg	pack of 60	16.20	BNF Jan 2019 ³
	Oxycodone 5mg	pack of 28	12.52	BNF Jan 2019 ³
	Oxycodone 10mg	pack of 56	25.04	BNF Jan 2019 ³
	Oxycodone 15mg	pack of 56	38.12	BNF Jan 2019 ³
	Paracetamol 500mg	pack of 100	1.56	BNF Jan 2019 ³
	Paracetamol 1000mg	pack of 100	2.50	BNF Jan 2019 ³
	Tramadol 50mg	pack of 60	4.60	BNF Jan 2019 ³
	Tramadol 100mg	pack of 60	14.47	BNF Jan 2019 ³
	Tramadol 150mg	pack of 60	21.71	BNF Jan 2019 ³
	Amoxicillin 250mg	pack of 21	0.97	BNF Jan 2019 ³
	Amoxicillin 500mg	pack of 21	1.11	BNF Jan 2019 ³
	Ciprofloxacin 250mg	pack of 10	0.83	BNF Jan 2019 ³
	Ciprofloxacin 750mg	pack of 10	8.00	BNF Jan 2019 ³
	Clarithromycin 500mg	pack of 7	6.72	BNF Jan 2019 ³
	Clindamycin 150mg	pack of 24	3.90	BNF Jan 2019 ³
	Co-amoxiclav 250mg/125mg	pack of 21	1.77	BNF Jan 2019 ³
	Doxycycline 100mg	pack of 8	0.76	BNF Jan 2019 ³
	Flucloxacillin 250mg	pack of 28	1.08	BNF Jan 2019 ³
	Flucloxacillin 500mg	pack of 28	2.01	BNF Jan 2019 ³
	Flucloxacillin 1000mg	pack of 10	49.00	BNF Jan 2019 ³
	Fucidin 500mg	pack of 1	20.90	BNF Jan 2019 ³
	Metronidazole 500mg	pack of 21	38.39	BNF Jan 2019 ³

Resource item	Type	Unit type	Unit cost (£)	Source
Anticoagulant	Nitrofurantoin 50mg	pack of 28	8.23	BNF Jan 2019 ³
	Phenoxymethylpenicillin 250mg	pack of 28	0.90	BNF Jan 2019 ³
	Rifampicin 150mg	pack of 100	50.49	BNF Jan 2019 ³
	Teicoplanin 400mg	pack of 1	7.32	BNF Jan 2019 ³
	Trimethoprim 100mg	pack of 28	0.87	BNF Jan 2019 ³
	Trimethoprim 200mg	pack of 14	1.00	BNF Jan 2019 ³
	Apixaban 2.5mg	pack of 60	57.00	BNF Jan 2019 ³
	Apixaban 5mg	pack of 56	53.20	BNF Jan 2019 ³
	Clopidogrel 75mg	pack of 28	1.47	BNF Jan 2019 ³
	Dabigatran 150mg	pack of 60	51.00	BNF Jan 2019 ³
	Dalteparin 2,500units/0.2ml	pack of 10	18.58	BNF Jan 2019 ³
	Dalteparin 18,000units/0.72ml	pack of 5	50.82	BNF Jan 2019 ³
	Edoxaban 15mg	pack of 10	17.50	BNF Jan 2019 ³
	Edoxaban 60mg	pack of 28	49.00	BNF Jan 2019 ³
	Enoxaparin 20mg/0.2ml	pack of 10	20.86	BNF Jan 2019 ³
	Enoxaparin 40mg/0.4ml	pack of 10	30.27	BNF Jan 2019 ³
	Rivaroxaban 10mg	pack of 30	54.00	BNF Jan 2019 ³
	Rivaroxaban 15mg	pack of 28	50.40	BNF Jan 2019 ³
	Rivaroxaban 20mg	pack of 28	50.40	BNF Jan 2019 ³
	Tinzaparin 4,500units/0.45ml	pack of 10	35.63	BNF Jan 2019 ³
	Tinzaparin 12,000units/0.6ml	pack of 10	71.40	BNF Jan 2019 ³
Antidepressant	Warfarin 1mg	pack of 28	0.53	BNF Jan 2019 ³
	Amitriptyline 10mg	pack of 28	0.99	BNF Jan 2019 ³
	Amitriptyline 25mg	pack of 28	0.76	BNF Jan 2019 ³
	Citalopram 10mg	pack of 28	0.89	BNF Jan 2019 ³
	Citalopram 20mg	pack of 28	1.08	BNF Jan 2019 ³
	Duloxetine 60mg	pack of 28	4.67	BNF Jan 2019 ³

Resource item	Type	Unit type	Unit cost (£)	Source
	Fluoxetine 10mg	pack of 30	44.00	BNF Jan 2019 ³
	Fluoxetine 20mg	pack of 30	0.64	BNF Jan 2019 ³
	Mirtazapine 30mg	pack of 28	1.18	BNF Jan 2019 ³
	Sertraline 50mg	pack of 28	0.81	BNF Jan 2019 ³
	Sertraline 100mg	pack of 28	1.08	BNF Jan 2019 ³
Bisphosphonate	Alendronic acid 10mg	pack of 28	1.63	BNF Jan 2019 ³
Corticosteroid	Clobetasone 30g	each	1.86	BNF Jan 2019 ³
Hypnotic/ anxiolytic	Chlordiazepoxide 10mg	pack of 100	17.80	BNF Jan 2019 ³
	Diazepam 10mg	pack of 28	0.65	BNF Jan 2019 ³
	Temazepam 10mg	pack of 28	1.46	BNF Jan 2019 ³
	Zolpidem 10mg	pack of 28	0.97	BNF Jan 2019 ³
	Zopiclone 3.75mg	pack of 28	0.88	BNF Jan 2019 ³
Antiemetic	Zopiclone 7.5mg	pack of 28	0.89	BNF Jan 2019 ³
	Domperidone 10mg	pack of 30	0.97	BNF Jan 2019 ³
	Metoclopramide 10mg	pack of 28	0.55	BNF Jan 2019 ³
	Ondansetron 4mg	pack of 10	0.85	BNF Jan 2019 ³
Supplement	Calcium 750mg	pack of 112	2.95	BNF Jan 2019 ³
	Calcium 1000mg	pack of 28	16.07	BNF Jan 2019 ³
	Calcium 1250mg	pack of 100	9.33	BNF Jan 2019 ³
	Calcium 1500mg	pack of 100	8.70	BNF Jan 2019 ³
	Glucosamine 1500mg	pack of 30	18.20	BNF Jan 2019 ³
Vitamin	Iron 210mg	pack of 84	3.50	BNF Jan 2019 ³
	Calcitriol 250ng	pack of 100	18.04	BNF Jan 2019 ³
	Colecalciferol 800units	pack of 30	3.60	BNF Jan 2019 ³
	Colecalciferol 20,000units	pack of 30	29.00	BNF Jan 2019 ³
	Colecalciferol 50,000units	pack of 10	36.00	BNF Jan 2019 ³
	Multi-vitamin	pack of 30	0.46	PCA Oct 2018 ¹⁰
	Thiamine 50mg	pack of 100	4.93	BNF Jan 2019 ³
	Thiamine 100mg	pack of 100	7.15	BNF Jan 2019 ³

Resource item	Type	Unit type	Unit cost (£)	Source
Direct nonmedical cost				
Personal social services	Frozen meals-on-wheels	per meal	3.17	Meals on wheels (LBM) ¹¹
	Hot meals-on-wheels	per meal	6.75*	PSSRU 2014 p. 127 ⁸
	Laundry services	per load	4.60	North Yorkshire County Council, 2019 ¹²
	Social worker	per hour	60	PSSRU 2018 p. 139 ⁷
	Care worker/ help at home	per hour	27	PSSRU 2018 p. 143 ⁷
Aids and adaptations	Crutch	each	8.24	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Stick	each	4.10	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Zimmer frame	each	18.60	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Grab rail	each	13.80	PSSRU 2018 p. 92
	Dressing aid	each	7.26	NHS Supply Chain Catalogue Jan 2019 (average) ¹
	Long-handle shoe horn	each	2.72	NHS Supply Chain Catalogue Jan 2019 (average) ¹
Indirect cost				
Lost productivity	Median wage	per week	569	Employee earnings in the UK: 2018 (37.5 hours per week assumed) ¹³

BNF: British National Formulary, LBM: London Borough of Merton, LoS: Length of stay, PCA: Prescription Cost Analysis, PSSRU: Personal Social Services Research Unit

** Unit cost has been adjusted to 2017/18 prices.*

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