

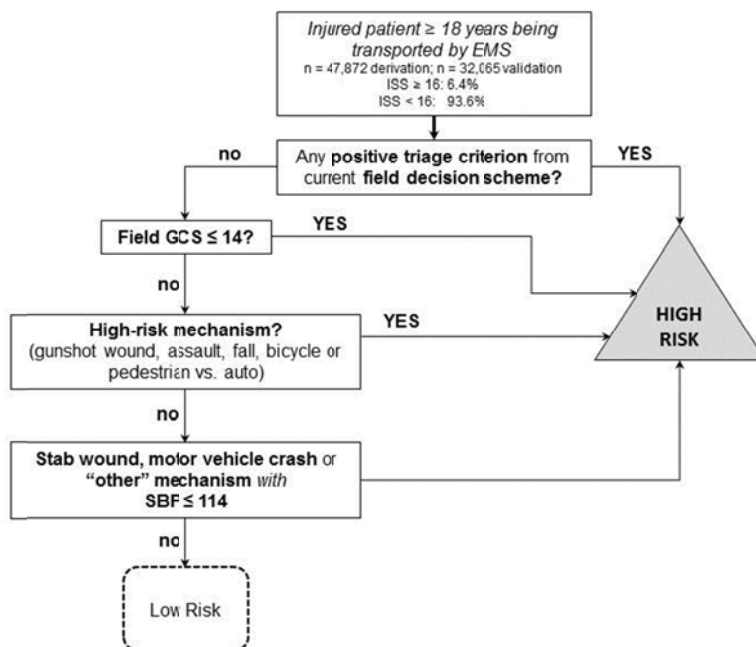
Appendix 1.

eMethods.

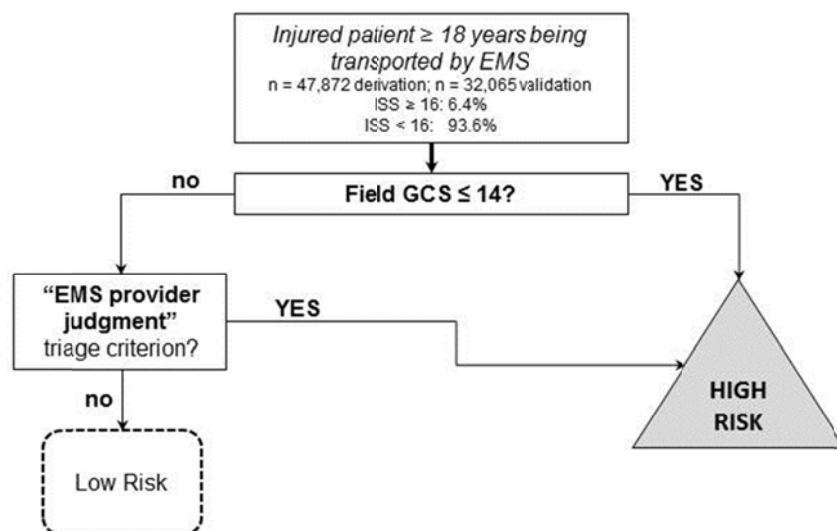
Categorization of field triage status: We determined field triage status (positive versus negative) based on any of the following: trauma triage criteria specified in the EMS chart; EMS provider documented “trauma system entry” (or similar charting, depending on local terminology); EMS-recorded trauma identification number (used at some sites as a mechanism for tracking injured patients entered into the trauma system); a matched trauma registry record specifying a “scene” (EMS-identified) trauma patient; or a matched phone record from the base hospital specifying a triage-positive patient (for sites requiring EMS personnel to notify trauma centers before arrival). These data sources were triangulated to increase the rigor and validity of the triage status variable. All patients not identified through the above data sources were considered triage negative.

Development of alternative field triage strategies: We used classification and regression tree (CART) analysis²⁹ to generate the two alternative strategies for field triage. CART uses binary recursive partitioning to create decision trees that optimize the identification of a subgroup of patients (i.e., $ISS \geq 16$) by partitioning the data through a series of splits using potential predictor variables and is well-suited for developing clinical decision rules. The primary target group was patients with “serious injury,” defined as an Injury Severity Score ($ISS \geq 16$), based on previous research demonstrating the survival benefit of treating these patients in major trauma centers.¹⁵⁻¹⁹ We constructed the trees using pre-specified misclassification costs and tree complexity parameters to develop decision rules with: (1) high-sensitivity ($\geq 95\%$) consistent with the national triage benchmark for under-triage and (2) high specificity ($\geq 65\%$) to meet the national benchmark for over-triage.⁶ To develop the two alternative triage strategies, we randomly selected 60% of the sample to derive the decision trees and the remaining 40% to validate them (split-sample method). We used cross-validation in the tree derivation process to minimize overfitting of the data and reduce bias in the estimation of rule performance. We considered 33 variables in the tree-building process, including 23 different triage criteria currently in use at the 6 sites, a composite measure of triage status (triage-positive vs. triage-negative), out-of-hospital physiologic measures, age and mechanism of injury. These decision trees should be considered hypothetical scenarios for field triage, but they approximate real-world trade-offs between sensitivity and specificity in triage strategies using information available to EMS.

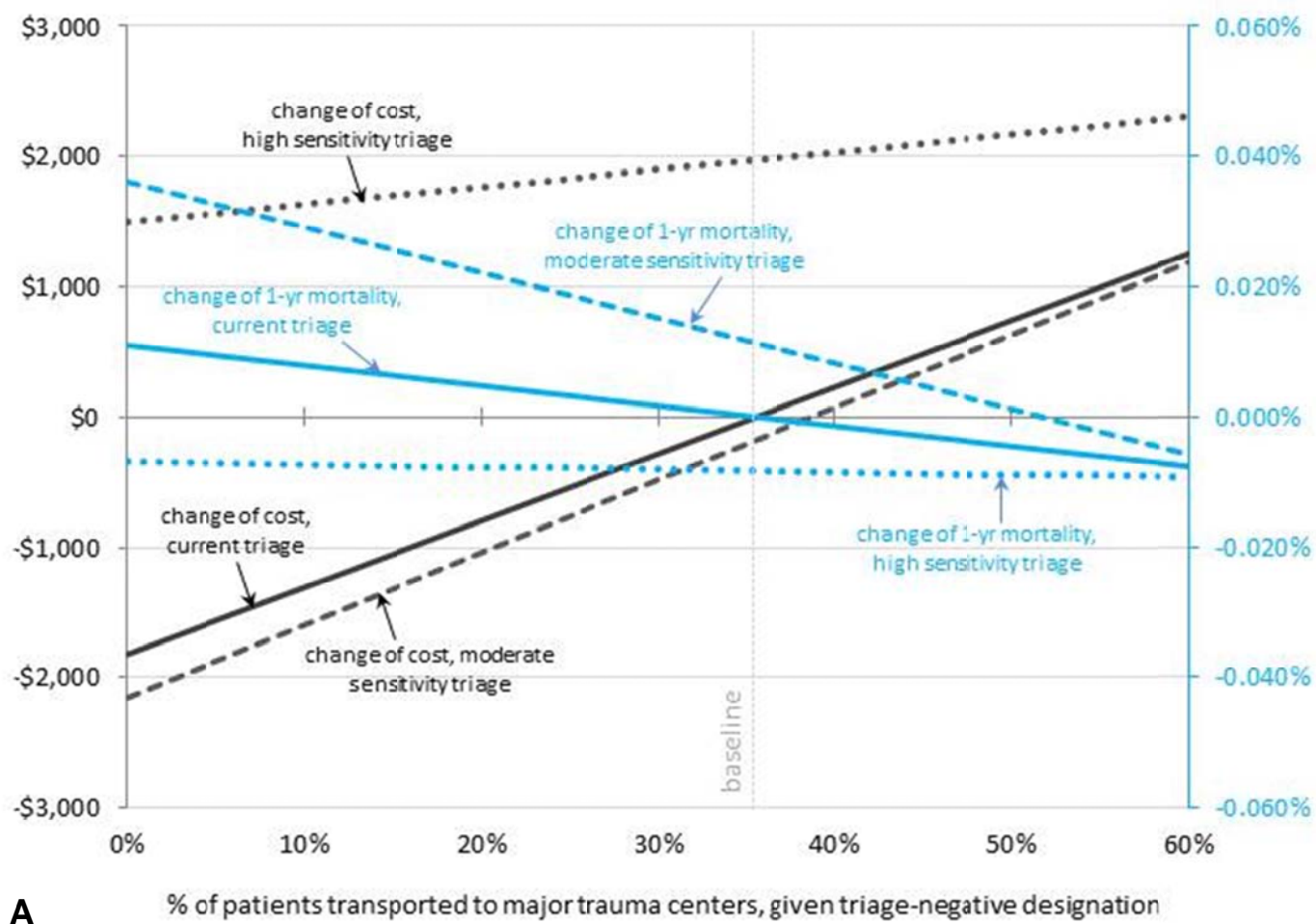
eFigure 1.

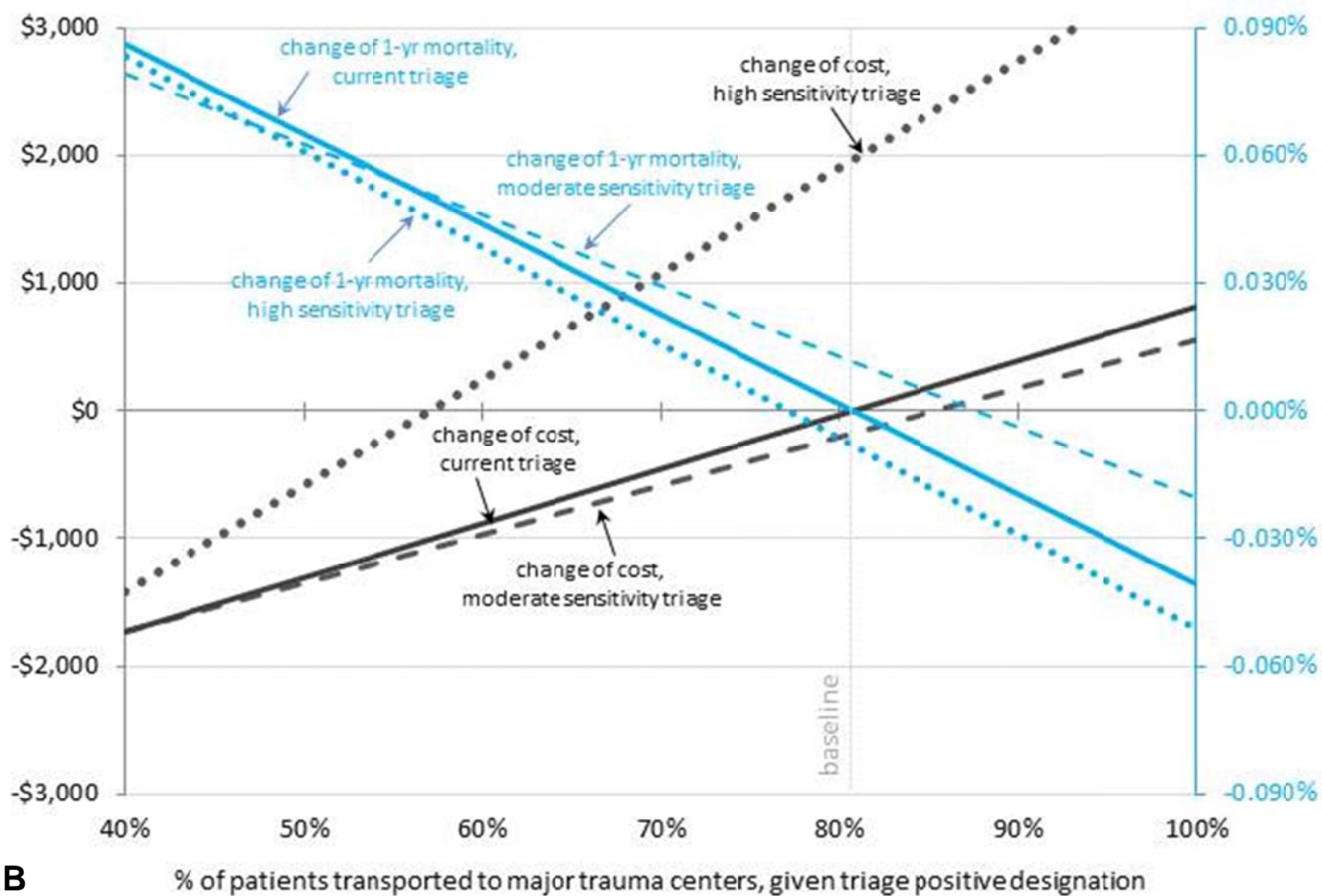


eFigure 2.

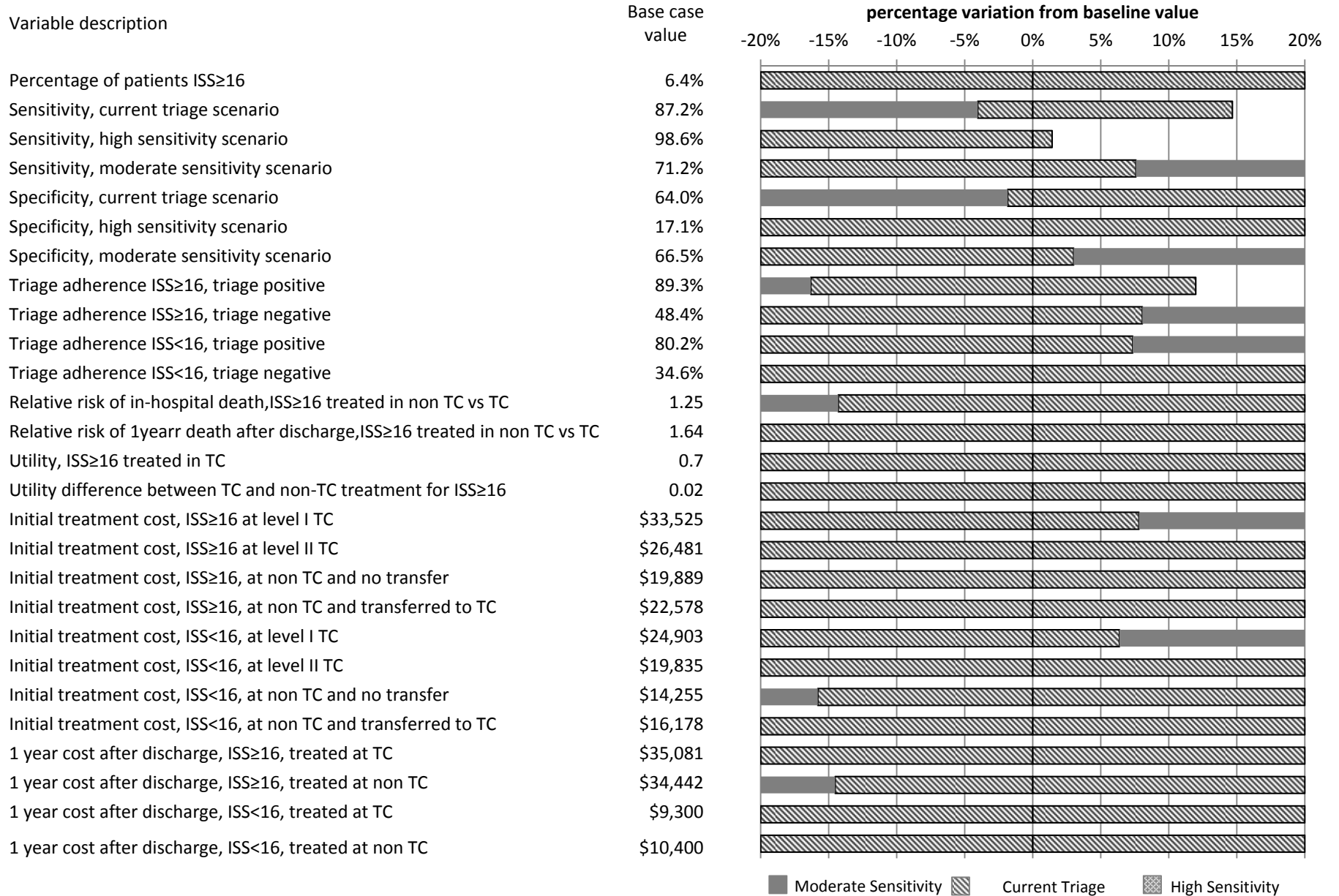


eFigure 3.





eFigure 4.



eTable 1. Input Parameter Distributions for Sensitivity Analysis

Description	Value (95% CI)	Distribution type	Distribution parameter	
			alpha/mu	beta/ sigma /lambda
Probability, %				
ISS \geq 16	6.43 (6.26-6.60)	beta*	5140	74796
Sensitivity				
Current triage	87.2 (86.3-88.1)		4479	658
High specificity	71.2 (70.0-72.5)		3658	1479
High sensitivity	98.6 (98.3-98.9)		5065	72
Specificity				
Current triage	64.0 (63.7-64.4)		47871	26927
High specificity	66.5 (66.2-66.9)		49741	25057
High sensitivity	17.1 (16.9-17.4)		12790	62008
Triage adherence (site transported to)				
If ISS \geq 16, triage positive				
Level I or II TC	89.3 (88.4-90.2)		4001	479
Non TC	10.7 (9.8-11.6)		N/A	
If ISS \geq 16, triage negative				
Level I or IITC	48.4 (44.6-52.2)		318	338
Non TC	51.6 (47.8-55.4)		N/A	
If ISS<16, triage positive				
Level I or II TC	80.2 (79.8-80.7)		21586	5313
Non TC	19.8 (19.3-20.2)		N/A	
If ISS<16, triage negative				
Level I or II TC	34.6 (34.2-35.0)		16573	31325
Non TC	65.2 (65.0-65.8)		N/A	
Level 1 among transported to TC				
If ISS \geq 16, triage positive	91.7 (90.8-92.5)		3669	332
If ISS \geq 16, triage negative	91.8 (88.3-94.4)		291	26
If ISS<16, triage positive	81.8 (81.3-82.3)		17658	3929
If ISS<16, triage negative	69.2 (68.5-69.9)		11450	5096
Transfer from non TC to TC				
If ISS \geq 16				
If triage positive	26.5 (22.8-30.6)		90	248
If triage negative	32.5 (27.7-37.6)	110	228	
If ISS<16				
If triage positive	7.4 (6.7-8.1)	393	4918	

	If triage negative	4.3 (4.1-4.6)		228	5083
	In-hospital mortality				
	If ISS \geq 16			0.045	
	Treated in level 1 TC	10.0 (9.2-10.9)		514	4623
	RR if treated in level 2 TC	1	N/A	N/A	
	RR if treated in non-TC	1.25 (1.00-1.58)	log normal	0.2231	0.1138
	If ISS<16	1.2 (1.2-1.3)	beta	898	73900
	1-y mortality after initial discharge				
	If ISS \geq 16				
	Treated in TC	3.0 (2.5-3.5)	beta	138	4470
	Relative risk if treated in non-TC	1.64 (1.08-2.49)	log normal	0.4947	0.2131
	If ISS<16	1.7 (1.6-1.8)	beta	1256	72614
	Baseline lifetime mortality after 1-y	age-specific	N/A		
	Hazard ratios for lifetime mortality				
	If ISS \geq 16	5.19 (3.94-6.52)	log normal	1.6467	0.1406
	If ISS<16	1.38 (1.09-1.69)		0.3221	0.1204
	Utility				
	1-y quality of life				
	If ISS \geq 16				
	Treated in TC	0.70 (0.60-0.79)	beta [†]	36	16
	Treated in non-TC	0.68 (0.57-0.78)		24	1200
	If ISS<16	0.80 (0.66-0.93)		10	89
	Yearly decrease in quality of life, %	3	N/A		
	Cost				
	Initial treatment				
	If ISS \geq 16				
	Level 1 TC	33,525 (32,724-34,326)	Gamma	6,732	0.2008
	Level 2 TC	26,481 (25,161-27,801)		1,548	0.0584
	Non TC, no transfer	19,889 (18,894-20,884)		1,537	0.0772
	Non TC, transfer	22,578 (20,908-24,247)		704	0.0311
	If ISS<16				
	Level 1 TC	24,903 (24,370-25,436)		8,388	0.3368
	Level 2 TC	19,835 (19,453-20,217)		10,359	0.5222
	Non TC, no transfer	14,255 (13,928-14,582)		7,302	0.5122
	Non TC, transfer	16,178 (15,685-16,672)		4,139	0.2558
	1-y post-injury treatment				
	If ISS \geq 16				
	TC (level 1 and 2, including transfer)	35,081 (31,509-38,653)		96	0.0027
	Non TC	34,442 (31,230-37,654)		115	0.0033

	If ISS<16			
	TC (level 1 and 2, including transfer)	9,300 (8,300-10,200)		86 0.0093
	Non TC	10,400 (9,600-11,300)		169 0.0163
	% Increase in lifetime healthcare expenditure			
	If ISS \geq 16	1.45 (1.10-1.81)	log normal	0.3716 0.1409
	If ISS<16	1.25 (1.02-1.57)		0.2231 0.1037
	Yearly decrease in cost, %	3	N/A	

*For number n of probability values that should add up to 100%, we only vary number n-1 of probability values at the same time.

†For the groups 'ISS \geq 16 and treated in non-TC' and 'ISS<16', we vary the utility difference compared to the baseline group 'ISS \geq 16 and treated in non-TC'.

TC, trauma center; ISS, Injury Severity Score.