Appendix E-1

Model Design

The starting point of the model is infection at the site of a total hip arthroplasty. Following the model from left to right, the tree divides from its root and continues to branch at nodes, each of which represents an opportunity for a patient to enter into one or more health states that a patient might experience during the course of treatment. Each branch of the tree has a corresponding health state and has an associated utility value. As the patient proceeds through the model (s)he will end up in either a terminal state (e.g., death) where (s)he will remain for the life of the model, or (s)he will move into a recursive health state (e.g., reinfection) and begin a subsequent cycle through the model.

One of the key structures of our Markov model is the tunnel that we created for the four-month waiting period between the two procedures of the two-stage revision. During the literature review, we noted that 3.4% (eleven) of 321 patients did not go on to complete the second stage[5-15]. One hundred percent of patients treated with the first stage of a two-stage protocol would initially move into the tunnel, and 3.4% (eleven) would not leave it but would remain in that state for the life of the model. Patients with a repeat infection could recycle back into the tunnel state, with 3.4% of the patients never leaving the health state and the remainder of the patients going on to receive a repeat two-stage revision. For repeated cycles, we continued to assume that 3.4% of patients scheduled to receive a repeat staged procedure would not undergo a second stage.

This portion of the two-staged model was duplicated in the direct-exchange arm for patients who had reinfection. Patients from the direct-exchange cohort who had a reinfection were subsequently treated with a two-stage revision protocol, penalizing the direct-exchange protocol. In clinical practice, patients for whom a direct exchange fails typically go on to have a staged protocol.

TABLE E-1 Data from Articles on Treatment of Infection at the Site of Total Hip Arthroplasty*

					Reinfections				Mechanical Complications					
Study	Year	No. of Hips	Mean Age *(yr)*	Successful Revision Total Hip Arthroplasties	Total	Treated with Repeat Revision	Treated with Resection	Treated with Antibiotics	Total	Treated Operatively	Treated Nonoperatively	Deaths	2nd Stage Not Performed	Interval Between Stages *(wk)*
Staged revision														
Younger et al.[15]	1998	27	68.5	16	1	1	0	0	8	5	3	2	0	12
Tsukayama et al.[13]	1996	41	63	30	6	4	2	0	5	5	0	0	0	15.7
Hsieh et al.[8]	2005	24	59	22	0	0	0	0	2	2	0	0	0	13.6
Kraay et al.[10]	2005	28	53	22	2	2	0	0	4	4	0	0	0	7.4 mo
Hsieh et al.[7]	2004	42	NA	36	2	0	1	1	2	2	0	0	2	12.2
Yamamoto et al.[14]	2003	17	59	15	0	0	0	0	0	0	0	0	2	18.5
Hofmann et al.[6]	2005	34	64	23	1	0	1	0	0	0	0	3	7	14
Takahira et al.[12]	2003	9	67.1	8	1	1	0	0	0	0	0	0	0	10.1
Haddad et al.[5]	2000	48	60	44	4	2	2	0	0	0	0	0	0	NA
Koo et al.[9]	2001	22	56	12	1	0	1	0	8	1	7	1	0	9
Masri et al.[11]	2007	29	65	23	3	1	1	1	1	1	0	2	0	37
Total/average		321	61.5	251	21	11	8	2	30	20	10	8	11	15.6
Rate				0.782	0.065	0.524	0.381	0.095	0.093	0.666	0.333	0.025	0.034	
Direct exchange														
Ure et al.[20]	1998	20	61.4	18	0	0	0	0	2	2	0	0		
Raut et al.[18]	1994	57	66	36	8	0	5	3	13	2	11	0		
Hope et al.[17]	1989	72	64	61	9	9	0	0	2	2	0	0		
Callaghan et al.[21]	1999	24	65.3	21	2	0	2	0	1	1	0	0		
Wroblewski[16]	1986	99	63	63	9	2	3	4	24	2	22	3		
Raut et al.[19]	1996	15	65	11	1	1	0	0	3	1	2	0		
Laffargue et al.[22]	2003	106	66	78	13	13	0	0	15	11	4	0		
Raut et al.[23]	1995	183	64.5	126	29	18	0	11	28	4	24	0		
Total/average		576	64.4	414	71	43	10	18	88	25	63	3		
Rate				0.7188	0.1233	0.6056	0.1408	0.2535	0.1528	0.2841	0.7159	0.0052		

*The indication for surgery was an infection that had been present at the site of a hip arthroplasty for greater than three weeks. The values are given as the number of hips unless otherwise indicated. NA = not avai