

### Computer Navigation

There have been 96,730 primary total knee replacement procedures reported to the Registry in which computer navigation was used. In 2016, computer navigation was used in 30.8% of all primary total knee replacement procedures.

Patients aged less than 65 years have a lower rate of revision when computer navigation is used. There is no difference in the rate of revision for the 65 years or older age group (Table KT25 and Figure KT27). However, there is a reduction in the rate of revision for navigated knee replacement due to loosening in both age groups (Figure KT28).

### Image Derived Instrumentation (IDI)

There have been 20,931 primary total knee replacement procedures undertaken using IDI since 2009. In 2016, IDI was used in 10.4% of all primary total knee replacement procedures.

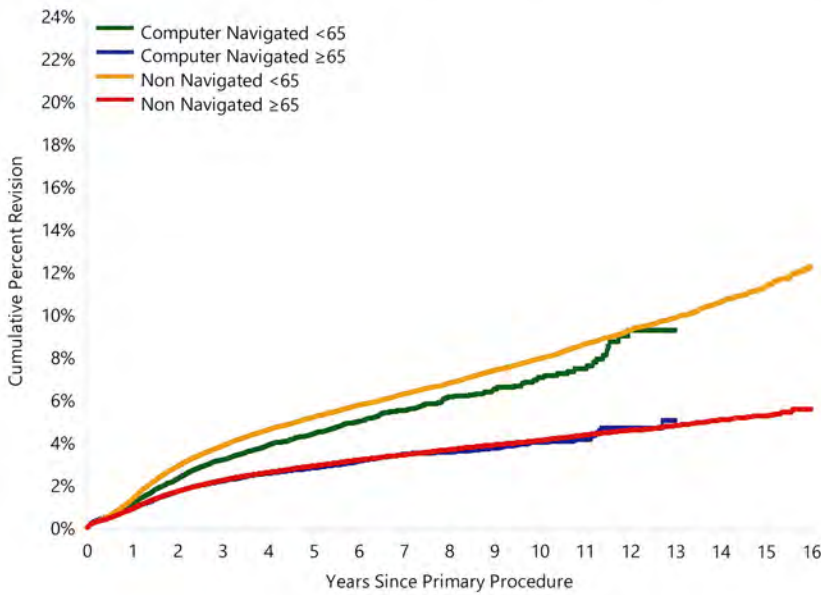
There is a lower rate of revision in the first three months when IDI is used compared to non IDI. From three months to 1.5 years this is reversed and there is a higher rate of revision. After this time, there is no difference in the rate of revision between IDI and non IDI (Table KT26 and Figure KT29).

The difference is age dependent and there is no difference in patients aged less than 65 years. However, there is an increased rate of revision for patients aged 65 years or older after three months (Table KT27 and Figure KT30).

**Table KT25 Cumulative Percent Revision of Primary Total Knee Replacement by Computer Navigation and Age (Primary Diagnosis OA)**

Navigation	Age	N Revised	N Total	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	16 Yrs
<b>Computer Navigated</b>		<b>2582</b>	<b>96730</b>	<b>1.0 (0.9, 1.0)</b>	<b>2.6 (2.4, 2.7)</b>	<b>3.4 (3.3, 3.5)</b>	<b>5.1 (4.8, 5.4)</b>		
	<65	1195	34089	1.1 (1.0, 1.2)	3.2 (3.0, 3.4)	4.4 (4.2, 4.7)	7.1 (6.5, 7.7)		
	≥65	1387	62641	0.9 (0.8, 1.0)	2.2 (2.1, 2.3)	2.8 (2.7, 3.0)	4.0 (3.7, 4.3)		
<b>Non Navigated</b>		<b>17045</b>	<b>437472</b>	<b>1.0 (1.0, 1.1)</b>	<b>2.8 (2.7, 2.8)</b>	<b>3.7 (3.6, 3.7)</b>	<b>5.4 (5.3, 5.5)</b>	<b>7.4 (7.2, 7.6)</b>	<b>8.0 (7.7, 8.3)</b>
	<65	8188	141524	1.4 (1.3, 1.4)	3.8 (3.7, 3.9)	5.2 (5.1, 5.3)	7.9 (7.7, 8.1)	11.3 (11.0, 11.7)	12.3 (11.7, 12.9)
	≥65	8857	295948	0.9 (0.8, 0.9)	2.2 (2.2, 2.3)	2.9 (2.8, 3.0)	4.1 (4.0, 4.2)	5.3 (5.1, 5.5)	5.6 (5.3, 5.9)
<b>TOTAL</b>		<b>19627</b>	<b>534202</b>						

**Figure KT27 Cumulative Percent Revision of Primary Total Knee Replacement by Computer Navigation and Age (Primary Diagnosis OA)**



HR - adjusted for gender

Computer Navigated <65 vs Computer Navigated ≥65

0 - 3Mth: HR=1.10 (0.90, 1.35),p=0.367

3Mth - 9Mth: HR=1.26 (1.06, 1.50),p=0.010

9Mth - 1Yr: HR=1.54 (1.23, 1.92),p<0.001

1Yr - 2Yr: HR=1.44 (1.26, 1.63),p<0.001

2Yr - 2.5Yr: HR=1.98 (1.64, 2.40),p<0.001

2.5Yr - 3.5Yr: HR=1.60 (1.33, 1.93),p<0.001

3.5Yr+: HR=2.08 (1.82, 2.37),p<0.001

Computer Navigated ≥65 vs Non Navigated ≥65

Entire Period: HR=0.99 (0.93, 1.05),p=0.698

Computer Navigated <65 vs Non Navigated <65

Entire Period: HR=0.85 (0.80, 0.91),p<0.001

Non Navigated ≥65 vs Non Navigated <65

0 - 2Wk: HR=0.95 (0.75, 1.20),p=0.679

2Wk - 1Mth: HR=0.98 (0.83, 1.17),p=0.850

1Mth - 3Mth: HR=0.89 (0.77, 1.03),p=0.103

3Mth - 9Mth: HR=0.61 (0.56, 0.67),p<0.001

9Mth - 1.5Yr: HR=0.54 (0.50, 0.57),p<0.001

1.5Yr - 3Yr: HR=0.53 (0.50, 0.56),p<0.001

3Yr - 3.5Yr: HR=0.51 (0.45, 0.58),p<0.001

3.5Yr - 4.5Yr: HR=0.49 (0.44, 0.55),p<0.001

4.5Yr - 5Yr: HR=0.48 (0.40, 0.56),p<0.001

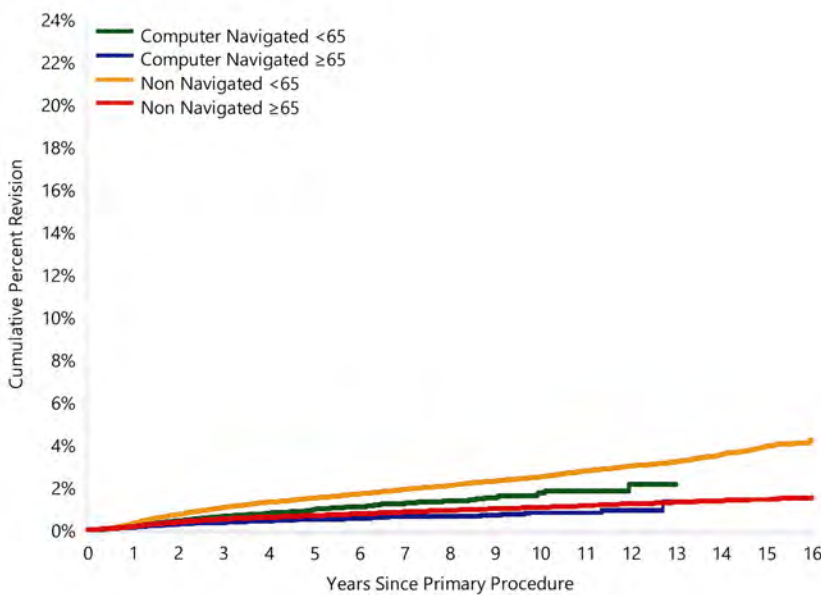
5Yr - 6.5Yr: HR=0.48 (0.43, 0.54),p<0.001

6.5Yr - 7Yr: HR=0.37 (0.29, 0.46),p<0.001

7Yr - 11Yr: HR=0.41 (0.37, 0.45),p<0.001

11Yr+: HR=0.33 (0.28, 0.39),p<0.001

**Figure KT28 Cumulative Percent Revision for Loosening of Primary Total Knee Replacement by Computer Navigation and Age (Primary Diagnosis OA)**



HR - adjusted for gender

Computer Navigated <65 vs Computer Navigated ≥65

0 - 2.5Yr: HR=1.64 (1.33, 2.02),p<0.001

2.5Yr+: HR=2.47 (1.95, 3.12),p<0.001

Computer Navigated ≥65 vs Non Navigated ≥65

Entire Period: HR=0.73 (0.64, 0.83),p<0.001

Computer Navigated <65 vs Non Navigated <65

Entire Period: HR=0.63 (0.55, 0.72),p<0.001

Non Navigated <65 vs Non Navigated ≥65

0 - 1Mth: HR=0.82 (0.49, 1.35),p=0.426

1Mth - 6Mth: HR=1.75 (1.37, 2.25),p<0.001

6Mth - 9Mth: HR=1.90 (1.50, 2.41),p<0.001

9Mth - 1.5Yr: HR=2.18 (1.92, 2.47),p<0.001

1.5Yr - 2Yr: HR=2.00 (1.67, 2.39),p<0.001

2Yr - 3Yr: HR=2.16 (1.87, 2.50),p<0.001

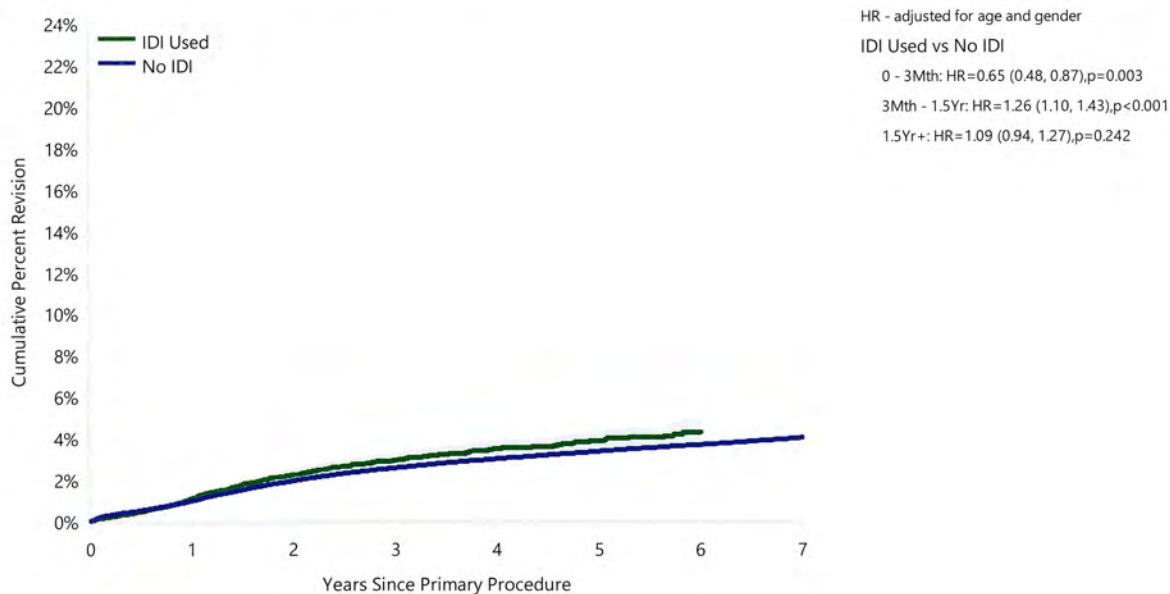
3Yr+: HR=2.74 (2.51, 2.99),p<0.001

Number at Risk	0 Yr	1 Yr	3 Yrs	5 Yrs	10 Yrs	15 Yrs	16 Yrs
<b>Computer Navigated</b>	<b>96730</b>	<b>79680</b>	<b>51117</b>	<b>30907</b>	<b>3363</b>	<b>0</b>	<b>0</b>
<65	34089	28102	18327	11418	1284	0	0
≥65	62641	51578	32790	19489	2079	0	0
<b>Non Navigated</b>	<b>437472</b>	<b>394601</b>	<b>312204</b>	<b>237714</b>	<b>89995</b>	<b>7947</b>	<b>1861</b>
<65	141524	127436	100961	77521	30922	3142	759
≥65	295948	267165	211243	160193	59073	4805	1102

**Table KT26 Cumulative Percent Revision of Primary Total Knee Replacement since 2009 by IDI Usage (Primary Diagnosis OA)**

IDI Usage	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
IDI Used	474	20931	1.1 (0.9, 1.3)	2.2 (2.0, 2.5)	2.9 (2.7, 3.2)	3.5 (3.2, 3.8)	3.9 (3.5, 4.3)	4.3 (3.8, 4.8)
No IDI	8263	321519	1.0 (0.9, 1.0)	1.9 (1.9, 2.0)	2.6 (2.5, 2.6)	3.0 (2.9, 3.1)	3.4 (3.3, 3.4)	3.7 (3.6, 3.8)
<b>TOTAL</b>	<b>8737</b>	<b>342450</b>						

**Figure KT29 Cumulative Percent Revision of Primary Total Knee Replacement since 2009 by IDI Usage (Primary Diagnosis OA)**

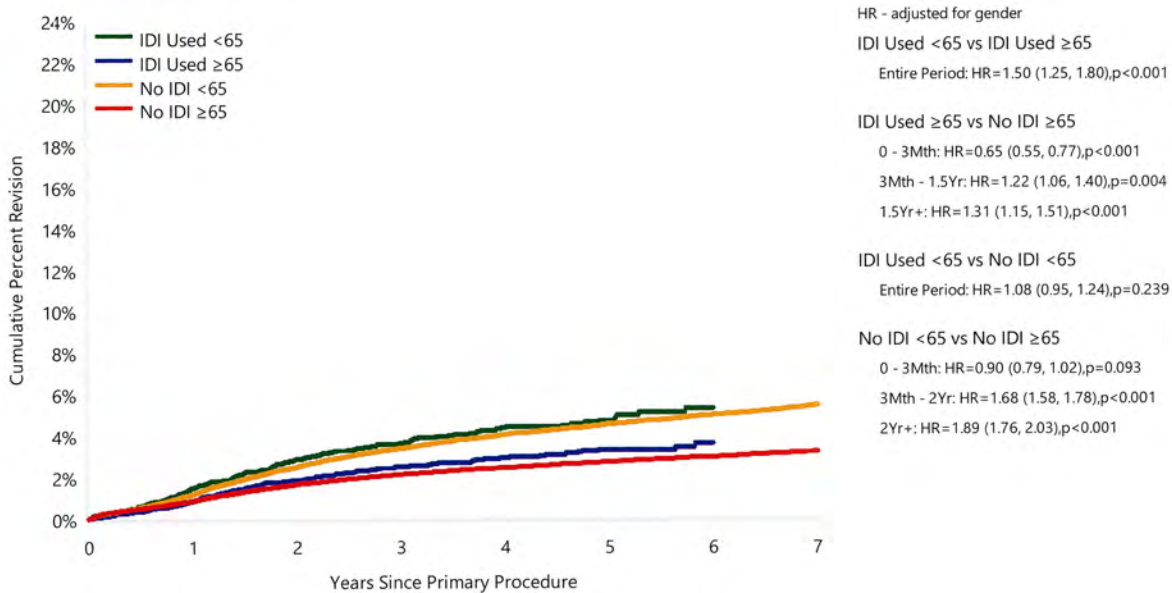


Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
IDI Used	20931	15350	10842	7685	4819	2608	751
No IDI	321519	271171	222122	176743	135375	96671	61075

**Table KT27 Cumulative Percent Revision of Primary Total Knee Replacement since 2009 by IDI Usage and Age (Primary Diagnosis OA)**

IDI Usage	Age	N Revised	N Total	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
<b>IDI Used</b>		<b>474</b>	<b>20931</b>	<b>1.1 (0.9, 1.3)</b>	<b>2.2 (2.0, 2.5)</b>	<b>2.9 (2.7, 3.2)</b>	<b>3.5 (3.2, 3.8)</b>	<b>3.9 (3.5, 4.3)</b>	<b>4.3 (3.8, 4.8)</b>
	<65	230	7890	1.5 (1.2, 1.8)	2.9 (2.5, 3.3)	3.6 (3.2, 4.2)	4.4 (3.8, 5.0)	4.7 (4.1, 5.4)	5.3 (4.5, 6.2)
	≥65	244	13041	0.8 (0.7, 1.0)	1.9 (1.6, 2.1)	2.5 (2.2, 2.9)	2.9 (2.5, 3.3)	3.3 (2.9, 3.8)	3.6 (3.0, 4.3)
<b>No IDI</b>		<b>8263</b>	<b>321519</b>	<b>1.0 (0.9, 1.0)</b>	<b>1.9 (1.9, 2.0)</b>	<b>2.6 (2.5, 2.6)</b>	<b>3.0 (2.9, 3.1)</b>	<b>3.4 (3.3, 3.4)</b>	<b>3.7 (3.6, 3.8)</b>
	<65	3812	109761	1.2 (1.1, 1.3)	2.5 (2.4, 2.6)	3.4 (3.3, 3.5)	4.0 (3.9, 4.2)	4.5 (4.4, 4.7)	5.0 (4.8, 5.2)
	≥65	4451	211758	0.9 (0.8, 0.9)	1.7 (1.6, 1.7)	2.1 (2.1, 2.2)	2.5 (2.4, 2.5)	2.7 (2.7, 2.8)	3.0 (2.9, 3.1)
<b>TOTAL</b>		<b>8737</b>	<b>342450</b>						

**Figure KT30 Cumulative Percent Revision of Primary Total Knee Replacement since 2009 by IDI Usage and Age (Primary Diagnosis OA)**



Number at Risk	0 Yr	1 Yr	2 Yrs	3 Yrs	4 Yrs	5 Yrs	6 Yrs
<b>IDI Used</b>	<b>20931</b>	<b>15350</b>	<b>10842</b>	<b>7685</b>	<b>4819</b>	<b>2608</b>	<b>751</b>
<65	7890	5881	4213	3073	1925	1066	326
≥65	13041	9469	6629	4612	2894	1542	425
<b>No IDI</b>	<b>321519</b>	<b>271171</b>	<b>222122</b>	<b>176743</b>	<b>135375</b>	<b>96671</b>	<b>61075</b>
<65	109761	92770	76352	61429	47580	34657	22020
≥65	211758	178401	145770	115314	87795	62014	39055