Comparable mortality but higher revision rate after uncemented compared with cemented total hip arthroplasties in patients 80 years and older: report of 43,053 cases of the Dutch Arthroplasty Register

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Background and purpose — Mortality and revision risks are important issues during shared decision-making for total hip arthroplasty (THA) especially in elderly patients. We examined mortality and revision rates as well as associated patient and prosthesis factors in primary THA for osteoarthritis (OA) in patients ≥ 80 years in the Netherlands.

Patients and methods — We included all primary THAs for OA in patients ≥ 80 years in the period 2007–2019. Patient mortality and prosthesis revision rates were calculated using Kaplan-Meier survival analyses. Risk factors for patient mortality and prosthesis revision were analyzed using multivariable Cox regression analysis adjusted for age, sex, ASA class, fixation method, head size, and approach.

Results — Mortality was 0.2% at 7 days, 0.4% at 30 days, 2.7% at 1 year, and 20% at 5 years. Mortality was higher in males and higher ASA class, but did not differ between fixation methods. The 1-year revision rate was 1.6% (95% CI 1.5–1.7) and 2.6% (CI 2.5–2.7) after 5 years. Multivariable Cox regression analysis showed a higher risk of revision for uncemented (hazard ratio [HR] 1.6; CI 1.4–1.8) and reverse hybrid THAs (HR 2.9; CI 2.1–3.8) compared with cemented THAs. Periprosthetic fracture was the most frequently registered reason for revision in uncemented THAs.

Interpretation — Mortality is comparable but revision rate is higher after uncemented compared with cemented THA in patients 80 years and older, indicating that cemented THA might be a safer option in this patient group.

Mortality and revision risks are important issues during shared decision-making for total hip arthroplasty (THA) especially in elderly patients. Associations have been found between higher mortality and some patient factors like sex, BMI, and comorbidity (1,2). Concerns have been raised about early mortality due to bone cement implantation syndrome (3), but an unambiguous association between early or late mortality and prosthesis fixation type has not been found in several register studies (1,4–7).

Beside mortality, revision rates are also influenced by patient and prosthesis factors (such as femur head size and type of fixation). Although the revision rate in the elderly could be influenced by the fact that not all patients are willing to undergo revision surgery due to comorbidity, the most important prosthesis factor that affects the rate of revision in elderly patients is the type of fixation. Higher revision rates, especially due to a periprosthetic fracture after uncemented hip replacement, have been found in several register studies (1,2,8–11).

Patient and surgical procedure characteristics as well as revision rates differ between countries (12), which justifies looking for confirmation of these international results in the Netherlands (17.5 million inhabitants).

We examined mortality and revision rates as well as associated patient and prosthesis factors in primary THA for OA in patients 80 years and older in the Netherlands.

Patients and methods

The Dutch Arthroplasty Register (LROI) was started in 2007 and has a completeness of 99% for primary and 97% for hip

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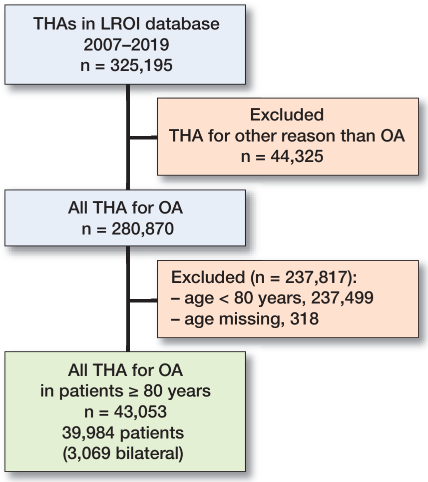

Figure 1. Patient flow.

revision arthroplasty (www.lroi-report.nl). The LROI database contains patient, procedure, and prosthesis characteristics. For each component a product number is registered to identify the characteristics of the prosthesis.

The vital status of all patients is obtained actively on a regular basis from Vektis, the national insurance database on healthcare in the Netherlands, which records all deaths of Dutch citizens (13). The LROI uses the opt-out system to require informed consent of patients. Revision is defined as a procedure where 1 or more components of the prosthesis were exchanged, added, or removed.

For this study we included all primary THAs for primary OA in patients 80 years and older in the period 2007–2019 and estimated mortality and revision rates. For mortality all patients were included with their 1st primary THA only in the case of bilaterality. 39,984 patients were included. For revision, all procedures (also patients with bilateral THA) were included (n = 43,053) (Figure 1). Second, we examined associated patient and prosthesis factors.

Statistics

The trend over time in primary THAs for OA in elderly patients was described, as well as patient and procedure characteristics using numbers and percentages. Patient factors like age and ASA class were categorized to analyze according to the LROI report.

Mortality

Survival time of the patient was calculated as the time from 1st primary THA to death of the patient or end of follow-up (January 1st 2020). Postoperative mortality at 7, 30, and 90 days, and 1, 3, and 5 years was calculated using Kaplan–Meier survival analyses and stratified by age, sex, ASA class, and fixation method because of their suspected influence on mortality. We considered non-overlapping 95% confidence intervals (CI) as statistically significant.

Independent risk factors for mortality were analyzed using Cox regression analysis. The comparisons were performed without adjustment (univariate analysis) and with adjustments for age, sex, ASA class, and type of fixation. For CIs, we assumed that the number of observed cases followed a Poisson distribution. The results of the Cox regression analyses are presented as hazard ratio (HR) with (CI).

Revision

Revision was defined as an intervention where 1 or more components of the prosthesis are exchanged, added, or removed.

We calculated incidence of revision after 1, 3, and 5 years using Kaplan–Meier survival analyses. In addition, competing risk analyses were performed as additional analysis to examine crude incidence of revision where death was considered to be a competing risk. Revision-free time of the prosthesis was calculated as the time from primary THA to revision procedure for any reason, death of the patient, or end of follow-up (January 1st, 2020).

Independent risk factors for revision were analyzed using Cox regression analysis. The comparisons were performed without adjustment (univariate analysis) and with adjustments for age, sex, ASA class, type of fixation, head size, and approach because of their suspected influence on revision.

For all covariates added to the model, the proportional hazards assumption was checked by inspecting log-minus-log curves and met.

Reasons for revision according to fixation method were described.

This study was reported in accordance with the STROBE guidelines.

Ethics, data sharing plan, funding, and potential conflicts of interests

The dataset was processed in compliance with the regulations of the LROI governing research on registry data. Data is available from the LROI but restrictions apply to the availability of this data, which was used under license for the current study. No external funding was received. No competing interests were declared.

Results

43,053 THA procedures in 39,984 patients were included and a rising trend in the annual number of THAs of patients ≥ 80 years was observed (2,792 in 2010 and 4,335 in 2019). The proportion of patients ≥ 80 years was stable (15% in 2010 and 2019) (14). 75% of patients were female, and 90% of them had ASA class II–IV and about half of THAs were performed with cemented fixation (Table 1).

Mortality

Of the 39,984 patients 5,867 died (7.7%) within 5 years

Table 1. Patient and prosthesis characteristics of 43,053 THA procedures in patients aged ≥ 80 years. Values are count (%) unless otherwise specified

Age, median (min-max)	83 (80–108)
Sex	
Male	10,931 (25)
Female	32,073 (75)
Missing	49 (0)
ASA class	
I	3,034 (7)
II	26,978 (63)
III–IV	11,929 (28)
Missing	1,112 (2)
Approach	
Anterior	6,082 (14)
Anterolateral	3,024 (7)
Direct lateral	7,958 (19)
Posterolateral	25,467 (59)
Other	178 (0)
Missing	344 (1)
Fixation	
Cemented	22,025 (51)
Hybrid	3,243 (8)
Reverse hybrid	987 (2)
Uncemented	16,376 (38)
Missing	422 (1)
Size femoral head	
22–28 mm	14,177 (33)
32 mm	21,741 (50)
36 mm	5,717 (13)
≥ 38 mm	337 (1)
Missing	1,081 (3)

Table 3. Risk factors for mortality adjusted for age, sex, ASA class, and fixation (N = 39,984)

Factor	n	Mortality HR adjusted (CI) [a]
Age		
80–84	28,839	1.0
85–89	9,526	1.5 (1.5–1.6)
≥ 90	1,619	2.4 (2.2–2.6)
Sex		
Male	10,255	1.5 (1.4–1.5)
Female	29,683	1.0
Missing	46	
ASA class		
I	2,841	0.7 (0.7–0.8)
II	25,045	1.0
III–IV	11,017	1.6 (1.6–1.7)
Missing	1,081	
Fixation		
Cemented	20,425	1.0
Hybrid	3,036	1.0 (0.9–1.0)
Reverse hybrid	908	0.9 (0.8–1.1)
Uncemented	15,215	1.0 (0.9–1.0)
Missing	400	

[a] Adjusted for age, sex, ASA class, and fixation.

after their primary THA (median follow up 4.2 years (0–13). Mortality rate was 0.2% (CI 0.2–0.2) within 7 days, 0.4% (CI 0.4–0.4) within 30 days, 0.8% (CI 0.8–0.8) within 90 days, 2.7% (CI 2.6–2.8) within 1 year, 9.6% (CI 9.4–9.8) within 3 years, and 20% (CI 20–20) within 5 years. Mortality was higher in males compared with females. Patients with a higher age and ASA class had higher mortality rates. Mortality was similar between fixation methods (Table 2).

Adjusted survival analyses using Cox regression models adjusted for age, sex, ASA class, and fixation showed that higher age (≥ 85 years), male sex, and higher ASA class were associated with a higher risk of death < 5 years after THA (age 85–89 HR 1.5 [CI 1.5–1.6], age ≥ 90 HR 2.4 [CI 2.2–2.6], male sex HR 1.5 [1.4–1.5], ASA class III–IV HR 1.6 [CI 1.6-1.7]). Type of fixation was not associated with a higher mortality risk (Table 3).

Revision

In 43,053 primary THA procedures 1,064 revisions were seen. 983 (94%) revisions were registered within 5 years after the primary THA. The median follow-up was 4.1 years (0–13) with the majority of revisions being a partial revision (cup or stem n = 580, femoral head and/or inlay n = 260), or total revision (including Girdlestone procedure) (n = 126).

Table 2. Mortality rates (%) with 95% CI in primary THAs in patients aged ≥ 80 years

Factor	n	7-day	30-day	Mortality 90-day	1-year	3-year	5-year
Total	39,984	0.2 (0.2–0.2)	0.4 (0.4–0.4)	0.8 (0.8–0.8)	2.7 (2.6–2.8)	9.6 (9.4–9.8)	20 (20–20)
Age							
80–84	28,839	0.1 (0.1–0.1)	0.3 (0.3–0.3)	0.6 (0.6–0.6)	2.1 (2.0–2.2)	7.9 (7.7–8.1)	17 (17–17)
85–89	9,526	0.2 (0.2–0.2)	0.6 (0.5–0.7)	1.3 (1.2–1.4)	3.7 (3.5–3.9)	13 (12 –13)	26 (25–26)
≥ 90	1,619	0.4 (0.2–0.6)	1.2 (0.9–1.5)	2.6 (2.2–3.0)	6.4 (5.8–7.0)	23 (21–24)	42 (41–44)
Missing	0						
Sex							
Male	10,255	0.2 (0.2–0.2)	0.6 (0.5–0.7)	1.3 (1.2–1.4)	4.0 (3.8–4.2)	13 (13–13)	26 (26–27)
Female	29,683	0.1 (0.1–0.1)	0.3 (0.3–0.3)	0.7 (0.7–0.7)	2.2 (2.1–2.3)	8.5 (8.3–8.7)	18 (18–18)
Missing	46						
ASA class							
I	2,841	0.0 (0.0–0.0)	0.1 (0.1–0.1)	0.4 (0.3–0.5)	1.5 (1.3–1.7)	5.9 (5.4–6.3)	12 (11–13)
II	25,045	0.1 (0.1–0.1)	0.3 (0.3–0.3)	0.6 (0.6–0.6)	1.9 (1.8–2.0)	7.8 (7.6–8.0)	18 (17–18)
III–IV	11,017	0.4 (0.3–0.5)	0.8 (0.7–0.9)	1,6 (1,5–1,7)	4.7 (4.5–4.9)	16 (15–16)	31 (30–31)
Missing	1,081						
Fixation							
Cemented	20,425	0.2 (0.2–0.2)	0.4 (0.4–0.4)	0.9 (0.8–1.0)	2.8 (2.7–2.9)	10 (10–10)	21 (20–21)
Uncemented	15,215	0.1 (0.1–0.1)	0.4 (0.3–0.5)	0.8 (0.7–0.9)	2.6 (2.5–2.7)	8.8 (8.5–9.1)	19 (19–20)
Reverse hybrid	908	0.0 (0.0–0.0)	0.1 (0.0–0.2)	0.6 (0.4–0.8)	2.5 (2.0–3.0)	10 (9.2–11)	21 (19–22)
Hybrid	3,036	0.1 (0.0–0.2)	0.4 (0.3–0.5)	0.7 (0.5–0.9)	2.3 (2.0–2.6)	9.9 (9.3–11)	20 (19–21)
Missing	400						

Table 4. Kaplan–Meier net revision rate (%) with 95% CI in primary THAs in patients aged ≥ 80 years

Factor	n	Revision rate 1 year	 3 year	 5 year
Total	43,053	1.6 (1.5–1.7)	2.3 (2.2–2.4)	2.6 (2.5–2.7)
Age				
80–84	30,643	1.6 (1.5–1.7)	2.0 (1.9–2.1)	2.6 (2.5–2.7)
85–89	10,624	1.8 (1.7–1.9)	2.4 (2.2–2.6)	2.8 (2.6–3.0)
≥ 90	1,786	1.8 (1.5–2.1)	2.2 (1.8–2.6)	2.2 (1.8–2.6)
Sex				
Male	10,931	2.1 (2.0–2.2)	2.5 (2.2–2.7)	3.3 (3.1–3.5)
Female	32,073	1.5 (1.4–1.6)	2.1 (2.0–2.2)	2.4 (2.3–2.5)
Missing	49			
ASA class				
I	3,034	1.3 (1.1–1.5)	2.1 (1.8–2.4)	2.8 (2.5–3.1)
II	26,978	1.6 (1.5–.17)	2.2 (2.1–2.3)	2.6 (2.5–2.7)
III–IV	11,929	1.9 (1.8–2.0)	2.4 (2.2–2.6)	2.7 (2.5–2.9)
Missing	1,112			
Fixation				
Cemented	22,025	1.3 (1.2–1.4)	1.8 (1.7–1.9)	2.2 (2.1–2.3)
Hybrid	3,243	1.4 (1.2–1.6)	1.8 (1.6–2.0)	2.0 (1.7–2.3)
Reversed hybrid	987	4.0 (3.4–4.6)	5.6 (4.8–6.2)	6.2 (5.4–7.0)
Uncemented	16,376	2.0 (1.9–2.1)	2.8 (2.7–2.9)	3.2 (3.0–3.5)
Missing	422			
Head size				
22–28 mm	14,177	1.4 (1.3–1.5)	2.1 (2.0–2.2)	2.6 (2.5–2.7)
32 mm	21,741	1.7 (1.6–1.8)	2.2 (2.1–2.3)	2.4 (2.3–2.5)
36 mm	5,717	2.1 (1.9–2.3)	2.8 (2.6–3.0)	3.2 (1.9–3.5)
≥ 38mm	337	2.5 (1.6–3.4)	5.0 (3.7–6.3)	7.5 (5.9–9.1)
Missing	1,081			
Approach				
Anterior	6,082	1.6 (1.4–1.8)	2.1 (1.9–2.3)	2.6 (2.3–2.9)
Anterolateral	3,024	1.3 (1.1–1.5)	1.6 (1.4–1.8)	2.1 (1.8–2.4)
Direct lateral	7,958	1.4 (1.3–1.5)	2.0 (1.8–2.2)	2.3 (2.1–2.5)
Posterolateral	25,467	1.8 (1.7–1.9)	2.4 (2.3–2.5)	2.8 (2.7–2.9)
Other	178	3.0 (1.7–4.3)	4.4 (2.5–6.3)	4.4 (2.5–6.3)
Missing	344			

Table 6. Risk factors for revision adjusted for age, sex, ASA class, fixation, head size, and approach (N = 43,053)

Factor	n	Revision HR adjusted (CI)
Age		
80–84	30,643	1.0
85–89	10,624	1.1 (1.0–1.3)
≥ 90	1,786	0.9 (0.6–1.3)
Sex		
Male	10,931	1.2 (1.1–1.4)
Female	32,073	1.0
Missing	49	
ASA class		
I	3,034	1.0 (0.8–1.3)
II	26,978	1.0
III–IV	11,929	1.1 (0.9–1.2)
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Uncemented	16,376	1.6 (1.4–1.8)
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Head size		
22–28 mm	14,177	1.1 (0.9–1.3)
32 mm	21,741	1.0
36 mm	5,717	1.1 (0.9–1.3)
≥ 38 mm	337	2.3 (1.5–3.5)
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Approach		
Anterior	6,082	0.8 (0.7–1.0)
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Direct lateral	7,958	0.8 (0.7–0.9)
Posterolateral	25,467	1.0
Other	178	1.6 (0.7–3.7)
Missings	344	

The revision rate was 1.6% (CI 1.5–1.7) at 1-year follow-up and 2.6% (CI 2.5–2.7) at 5-year follow-up (Table 4). Male patients had a higher revision rate within 1, 3, and 5 years compared with females. Patients with an ASA class III–IV had a higher revision rate within 1 and 3 years, although not after 5 years (Table 4). Uncemented THAs had a higher revision rate compared with cemented THAs (1 year revision rate uncemented THAs 2.0% [CI 1.9–2.1] vs. 1.3% [CI 1.2–1.4] for cemented THAs; 5-year revision rate uncemented THAs 3.2% [CI 3.0–3.5] vs. 2.2% [CI 2.1–2.3]). Reverse hybrid THAs (uncemented stem) also showed high revision rates at 1, 3, and 5-year follow-up, but numbers were small (n = 987). No statistically significant differences were seen in the case of larger femoral head size and different approaches; only head size ≥ 38mm showed higher revision rates, but the amounts were low (n = 337) (Table 4).

Competing risk analyses showed comparable crude revision rates (Table 5, see Supplementary data).

Multivariable Cox regression analysis adjusted for age, sex, ASA class, fixation, approach, and head size showed a higher risk of revision for males (HR 1.2 [CI 1.1–1.4]) and no statistically significant difference in risk of revision by age group and ASA class. Uncemented and reverse hybrid THAs (uncemented stem) were associated with a higher risk of revision (HR1.6 [CI 1.4–1.8]) and 3.0 [CI 2.3–4.0]) compared with cemented and hybrid THAs (cemented stem) (Table 6).

The most frequently registered reasons for revision were dislocation and periprosthetic fracture. Reasons for revision differed between types of fixation, with periprosthetic fracture being the most frequently registered reason for revision in uncemented THAs (185/492 = 38%) and reverse hybrid THA (25/57 = 44%) compared with cemented THAs (26/427 = 6%) and hybrid THA (2/61 = 3%). Dislocation was the most often registered reason for revision in cemented THA (108/427 = 42%) and hybrid THA 24/61 = 39% (Figure 2).

Discussion

Mortality

We found higher mortality rates in male patients, higher ASA class, and higher age. The Australian register reported com-

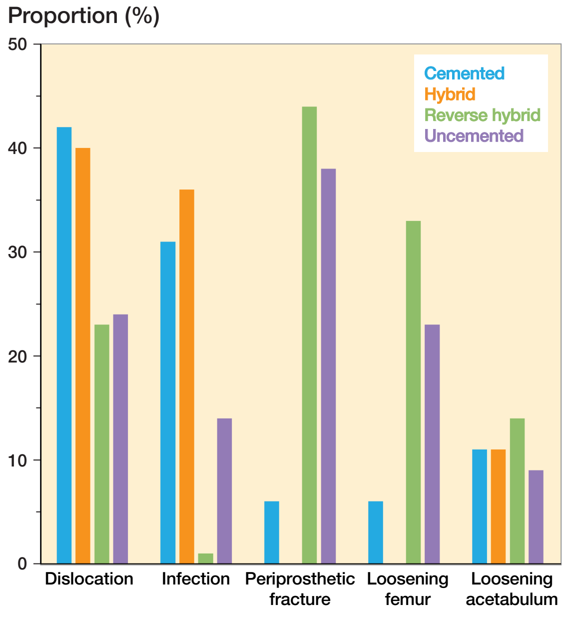

Figure 2. Reasons for revision (%) after THA in patients aged ≥ 80 years according to fixation method.

parable percentages of mortality of patients aged 80–89 years (n = 48,737); respectively 0.5% after 30 days, 0.9% after 90 days, 2.7% after 1 year, and 22% after 5 years (1).

Mortality was similar between patients with cemented, uncemented, hybrid, and reverse hybrid THAs at 7 days, 30 days, 90 days, 1, 3, and 5 years. This is comparable to other register studies. Jämsen et al. (8) found no differences in mortality between fixation methods at 90 days and 1 year of 4,777 primary THAs in 4,509 octogenarian patients with primary OA based on the Finnish Arthroplasty Register. Also, Pedersen et al. (7) showed similar early (within 90 days) mortality rates in the Nordic Arthroplasty Register Association database in 108,572 cemented and 80,034 uncemented THAs for OA after adjustment for comorbidity (HR 0.97 [CI 0.79–1.2]).

Ekman et al. (5) examined early postoperative mortality of patients (1–2 days and 3–10 days) in relation to bone cement implantation syndrome and early cardiovascular mortality based on Finnish registry data. They showed no differences between cemented and uncemented groups. Also, Dale et al. (2) found comparable 3-day mortality risks after cemented, uncemented, reverse hybrid, and hybrid THAs. We considered deaths within 7 days postoperatively as potentially associated with the cementation. Some differences were seen in < 7-day mortality between the cemented, uncemented, reverse hybrid, and hybrid fixation but the small numbers do not justify conclusions.

Revision

We showed higher revision rates in males, patients with higher ASA class, and uncemented THAs, especially uncemented stems (uncemented and reverse hybrid THA). Differences in revision rates according to fixation method were largely related to periprosthetic fractures in uncemented stems.

When we compare these results with other register studies, the Australian register also reported higher revision rates in patients aged > 75 years with uncemented THA after 1 year (2.3% [2.2–2.4]), 3 years (3.2% [3.0–3.3]), and 5 years (3.8% [3.6–4.0]) compared with cemented and hybrid fixation (1). Even when only analyzing the 3 prostheses with the lowest revision rate in > 1,000 procedures Tanzer et al. (11) found higher early revision rates in uncemented THA in patients 75 years and older using Australian registry data.

Jämsen et al. (8) presented results from the Finnish register where uncemented femoral stems had a 1.7-fold (CI 1.3–2.2) risk of early revision compared with their cemented counterparts. Periprosthetic fracture was the leading mode of failure after uncemented hip replacement (8).

In a benchmark study using data from the National Joint Registry of England, Wales, Northern Ireland, and the Isle of Man, the Exeter cemented THA scored the best in the male and female group aged 75 years and older (15).

All these results are still in accordance with the conclusion from Troelsen et al. (16) in a review of current fixation use and registry outcomes after data extraction from the annual reports of 7 national hip arthroplasty registries in THA from 2006 to 2010, suggesting that cemented fixation has the lowest risk for revision in patients older than 75 years.

Revision is defined in the LROI as an intervention where 1 or more of the prostheses are exchanged, removed, or added. Therefore, closed reduction as well as wound drainage and periprosthetic fractures without component exchange are not included in this study. Furthermore, as in any register study there might be selection bias as it is possible that a revision (for example because of wear) is no longer performed because of (increasing) comorbidity. Therefore, we focused on the revision rate in the relative short term (within 5 years after the primary operation).

In conclusion, this clinical-question-driven register report of 43,053 procedures of the Dutch Arthroplasty Register (LROI) shows that mortality is comparable but revision rate is higher after uncemented compared with cemented THA in patients 80 years and older, indicating that cemented THA might be a safer option in this patient group.

All authors contributed to the conception of the study, data analysis, and preparation of the manuscript.

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Supplementary data

Table 5. Crude cumulative incidence of revision (%) with 95% CI in primary THAs in patients aged ≥ 80 years

Factor	n	Revision rate 1 year	3 year	5 year
Total	43,053	1.6 (1.5–1.7)	2.2 (2.0–2.3)	2.5 (2.4–2.7)
Age				
80–84	30,643	1.5 (1.4–1.7)	2.1 (2.0–2.1)	2.6 (2.3–3.0)
85–89	10,624	1.8 (1.6–2.1)	2.3 (2.0–2.6)	2.8 (2.6–3.0)
≥ 90	1,786	1.8 (1.2–2.5)	2.1 (1.5–2.9)	2.1 (1.5–2.9)
Sex				
Male	10,931	2.0 (1.7–2.3)	2.7 (2.4–3.1)	3.1 (2.7–3.4)
Female	32,073	1.5 (1.3–1.6)	2.0 (1.8–2.2)	2.3 (2.2–2.5)
Missing	49			
ASA class:				
I	3,034	1.2 (0.9–1.7)	2.1 (1.6–2.6)	2.7 (2.1–3.3)
II	26,978	1.2 (1.4–1.7)	2.1 (2.0–2.3)	2.5 (2.3–2.7)
III–IV	11,929	1.8 (1.6–2.1)	2.3 (2.1–2.6)	2.5 (2.2–2.8)
Missing	1,112			
Fixation				
Cemented	22,025	1.3 (1.1–1.4)	1.7 (1.6–1.9)	2.0 (1.8–2.3)
Hybrid	3,243	1.2 (0.9–1.7)	1.7 (1.3–2.2)	1.9 (1.4–2.5)
Reverse hybrid	987	3.8 (2.8–5.3)	5.3 (4.1–7.0)	5.8 (4.5–7.6)
Uncemented	16,376	2.0 (1.8–2.2)	2.7 (2.4–3.0)	3.0 (2.8–3.3)
Missing	422			
Head size				
22–28 mm	14,177	1.4 (1.2–1.6)	2.0 (1.8–2.3)	2.4 (2.2–2.7)
32 mm	21,741	1.6 (1.5–1.8)	2.1 (1.9–2.3)	2.3 (2.1–2.6)
36 mm	5,717	2.0 (1.7–2.4)	2.7 (2.3–3.2)	3.0 (2.6–3.5)
≥ 38 mm	337	2.1 (1.0–4.4)	4.4 (2.6–7.3)	6.5 (4.2–9.9)
Missing	1,081			
Approach				
Anterior	6,082	1.6 (1.3–1.9)	2.0 (1.7–2.5)	2.5 (2.0–3.0)
Anterolateral	3,024	1.2 (0.9–1.7)	1.6 (1.2–2.1)	2.0 (1.5–2.6)
Direct lateral	7,958	1.4 (1.2–1.7)	2.0 (1.7–2.3)	2.2 (1.9–2.6)
Posterolateral	25,467	1.7 (1.5–1.8)	2.3 (2.1–2.5)	2.5 (2.3–2.7)
Other	178	2.9 (1.2–7.0)	4.3 (1.8–9.9)	4.3 (1.8–9.9)
Missing	344			