STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	2	Observational cohort study
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2	
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	3-4	Before introducing new ALBC strategies in revision hip- and knee arthroplasty patients based on the current hip fracture RCT and limited revision arthroplasty cohort studies, available data from joint registries should be used to evaluate re-revision risk with single or dual ALBC use.
Objectives	3	State specific objectives, including any prespecified hypotheses	4	Aim of our study was to determine the risk for re-revision following first revision hip- or knee arthroplasty, for all reasons excluding infection, and use of single- versus dual ALBC using real practice data from the Dutch arthroplasty registry. Furthermore, we aim to analyse the risk for re-revision based on the specific cement type used.
Methods				
Study design	4	Present key elements of study design early in the paper	5-6	Two datasets. Primary end point in our cohort study was the re-

				revision for any reason in revision hip or knee arthroplasty over the course of the follow up period regarding the use of single ALBC versus dual ALBC
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5	Lines 92-100
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5	included all registered revision hip and knee arthroplasties between the beginning of the LROI in 2007 and 2018 for outcome analysis. This results in a study time-frame ranging from January 1st 2007 until January 1st 2020. Primary revision for infection cases excluded.
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case	5	Revision arthroplasties for infection were not included since the selection of antibiotics in these patients is likely targeted on the determined microorganisms and not used for prophylaxis. All cases in registry period included.
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6	Primary end point in our cohort study was the re-revision for any reason in revision hip or knee arthroplasty over the course of the follow up period regarding the use of single ALBC versus dual ALBC, with

				a minimum follow up of two years. Adjustments were made for gender, age and ASA classification.
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	*6*	Patients with registered article numbers for bone cement were included in our dataset analyses.
Bias	9	Describe any efforts to address potential sources of bias	11	Discussion: A limitation of registry studies is that due to the observational nature we cannot draw conclusions on the causality of treatment groups. Information on individual infection risk or infections in medical history and vulnerability of patients may be overrepresented in the dual ALBC use groups. And information on perioperative, systemic antibiotic prophylaxis, which is routinely given and standard care in treatment protocols, is not registered in LROI. However, the relatively large number of subjects analysed in this study may give a better estimation of the effect of dual ALBC in general compared to the presented limited-size case series. The

			large sample size, including diversity in patients, surgeons and implants guarantee good generalizability and external validity.
Study size	10	Explain how the study size was arrived at	Registry study included all cases in the Netherlands during study period.

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Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	4	Quantitative date are used for table one, to compare the two groups of interest. Patients in the two datasets (hip revision of knee revision) were grouped according to ALBC use in order to to determine the risk for re-revision following first revision hip- or knee arthroplasty, for all reasons excluding infection, and use of single- versus dual ALBC
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6	Statistical methods are described and adjustments were made for gender, age and ASA classification.
		(*b*) Describe any methods used to examine subgroups and interactions		No subgroup analysis apart from the primary study outcome.
		(*c*) Explain how missing data were addressed		
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	5	Cohort study: Two datasets were composed from the LROI containing all patients with cemented hip or knee revision arthroplasties, for all reasons excluding infection. Patients with registered article numbers for bone cement were included in our dataset analyses. Also figure 1.
		(*e*) Describe any sensitivity analyses	6	The proportional hazards assumption for regression analysis was checked and met by inspecting Kaplan-Meier (KM) curves.
Results				

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Figure 1	
		(b) Give reasons for non-participation at each stage	6	Patients with registered article numbers for bone cement were included in our dataset analyses. Also figure 1.
		(c) Consider use of a flow diagram	Fig.1 and 2	
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Table 1	
		(b) Indicate number of participants with missing data for each variable of interest	Table 1	legends
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	5	We therefore included all registered revision hip and knee arthroplasties between the beginning of the LROI in 2007 and 2018 for outcome analysis. This results in a study time-frame ranging from January 1st 2007 until January 1st 2020.
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time		*Table 2 and fig 3a-d*
		Case-control study—Report numbers in each exposure category, or summary measures of exposure		*Table 2*
		Cross-sectional study—Report numbers of outcome events or summary measures		
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included		
		(*b*) Report category boundaries when continuous variables were categorized		Table 1
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period		

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Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9	The crude cumulative re-revision rate and follow up (minimum 50 patients at risk) for THA and TKA were calculated with 95%CI.
Discussion				
Key results	18	Summarise key results with reference to study objectives	10	With the use of 9,653 revision hip and knee arthroplasty cases from the Dutch Arthroplasty Register (LROI) we could not find an association between increased revision implant survival and the use of dual ALBC compared to single ALBC bone cement, with a minimum of 2-year follow-up. Adjusting for age, gender and ASA classification did not change our results. We found comparable re-revision rates up to 7- and 9-years follow-up for hip- and knee revision patients following first revision with most frequently used bone cement types.
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	216-256	Strengths and limitations
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	10	Antibiotics loading in bone cement has been part of treatment protocols in many European countries for decades(13, 14), whereas in the USA cost-effectiveness studies did not convince the FDA to allow its use for low-risk primary

				arthroplasty due to high costs(13, 15). A recent literature review with meta-analysis demonstrated a reduced risk for development of PJI when using ALBC versus plain bone cement in THA(16). A lower all-cause revision rate and revision for PJI rate was also shown with ALBC use in a large retrospective case control study, comparing 4,741 TKA implanted with plain bone cement versus 11,231 TKA implanted with ALBC showed that at 5 year follow(17). Another retrospective study however, could not detect a reduced PJI rate when comparing 1,434 TKA implanted with plain bone cement with 1,077 TKA implanted with ALBC(18). This will be further elucidated in a large prospective register-based RCT aimed to study the value of routine ALBC use in TKA(15). In a recent analysis in the Kaiser Joint Replacement Registry (87,018 TKA replacements) the additional cost of antibiotic bone cement was not justified but the risk for PJI in diabetic patients was reduced(19).
Generalisability	21	Discuss the generalisability (external validity) of the study results	12	Combining knowledge from cohort studies and RCTs with observational data from registry

				studies gives us a better understanding of the contribution of bone cement adjustments to the outcome, especially for our frail patients.
Other information				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	7	We did not receive any funding for this study.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.