Guest editorial

Early mortality after elective hip surgery

In this issue of Acta Orthopaedica, a study by Blom and colleagues on postoperative mortality following primary total hip arthroplasty appears in print (pages 347–50). The authors nicely present their data and different aspects of early postoperative mortality. Furthermore, none of the patients received chemical thrombosis prophylaxis routinely. The study is therefore an important contribution to the discussion on early mortality and causes of death in individuals without chemical thrombosis prophylaxis.

In Figure 1, Blom et al. show survival curves for categories of age and in Table 2 they quantify differences in 30- and 90-day accumulated mortality for the age categories. Furthermore, Table 1 is essential for discussion of what day deaths occur, and especially the causes of death. Tables 1 versus 2 demonstrate that there are basically two ways to present mortality, either as accumulated or instant mortality.

Accumulated mortality is counting the number of deaths within a given time interval (i.e. within 30, 60, or 90 days), or preferably using survival probabilities (e.g. Kaplan-Meier curves). Instant mortality, on the other hand, is the rate of deaths at a given time point (for example, the 20th postoperative day). Consequently, the word mortality alone is unspecific! (There is a strict formulation for the two measures and the relationship between them, which I omit here). Also, another important issue is that an increase in the instant mortality for just one day (e.g. the first postoperative day) would increase the accumulated mortality for infinity. Thus, accumulated numbers can not be used when it comes to discussing changes in mortality. Based on the curves in Figure 1 of Blom et al., showing differences in survival for age, one can however argue that there must be an age difference in the instant mortality, but not necessarily for the whole period.

In the general population, mortality increases with age (and is higher for men than for women). Is it interesting to find that high age and male sex are risk factors for mortality? Perhaps not, since this is the same as in a normal population, and it would be severe if age was not a risk factor for mortality.

In a study by myself and others (Lie et al. 2000), a curve for early survival is given (Figure 1B) which relates to patients with primary total hip arthroplasty. In this curve, one can see that the patient survival is lower than in a corresponding normal population until approximately the ninetieth postoperative day. Based on the difference between the early patient survival and the population survival, one can argue that there also has to be a difference in the early instant mortality. However, it is wrong to claim that the patient mortality is increased for 90 days! To discuss changes in mortality, one must calculate the instant (e.g. the daily) mortality. A curve showing daily mortality, and its change, during the early postoperative period is given in another large study (Lie et al. 2002; Figure 2). This curve shows that the daily patient mortality is higher than the daily population mortality only for the first 20 postoperative days.

Blom et al. list the accumulated 60-day mortality for a series of publications, ranging from 0.35% to 0.91%. Several questions arise from these numbers. How high would the mortality for a nonoperated group be, and consequently, what is the increased mortality for a hip replacement operation? If we stipulate that half of the mortality for operated patients can be attributed to a baseline mortality (Lie et al. 2002), the increased mortality for a hip operation is small. Furthermore, what are the different causes of death? Even if the sensitivity to

DOI 10.1080/17453670610046235

discover the correct cause of death may be low, the causes listed by Blom et al. are interesting. They find that the most common cause in the earliest postoperative period is ischemic heart disease. This is similar to the causes found by Lie et al. (2002). One can argue against the proportion of the different causes of death. Still, there are multiple causes of death, which may demand different—and possibly opposite—prophylactic actions; for example, one has to balance the risk of bleeding against the risk of thrombo-embolic events. Furthermore, in my opinion, eliminating all the excess mortality after major surgery sounds like an illusion.

In studies of mortality or any other outcome (e.g. deep vein thrombosis (DVT), pulmonary embolism (PE), or readmission to hospital) where the outcome is measured at a given time point or using survival curves, no conclusions can be drawn about when the outcome appears within the time span after the operation. For example, if two treatment regimes for prevention of DVT are given preoperatively and if, at day 60, one of the regimes proves to be superior to the other, no argument can be drawn as to how long the effect of the superior treatment regime persists.

Thus, any argument for the duration of mortality, venous thrombosis or other measures, based on accumulated numbers is wrong! And this applies to any type of study, randomized or not.

There has been a lack of proper randomized studies addressing the difference between treatment regimes for DVT or PE (and preferably mortality) evaluating the status of the patients for each day, and the change in status, with a figure or table showing the change. The design for such a study may be extensive and the sample size required will be large, particularly if the crucial difference in mortality for age (as mentioned by Blom et al.), gender, and other known risk factors is taken into consideration.

In my opinion, the study of Blom et al. forms a standard for smaller observational studies evaluating early postoperative mortality (and other outcomes), with its simple and frank presentation and discussion of early mortality and the causes of death.

To conclude, I believe there is an effect of thrombosis prophylaxis on DVT and PE, as there are numerous studies in support of this. However, I do not believe any arguments supporting a prolonged thrombosis prophylaxis based on accumulated numbers. I will not discuss the importance of reducing DVT, symptomatic or not, and leave this debate to others.

When it comes to mortality, there is an increased early postoperative mortality, which is highest in the first days after an operation, but the mortality decreases rapidly and is very low after the twentieth postoperative day. Due to multiple causes of death, however, the possibility of measuring a reduction in one of the causes as a result of prophylactic actions is very small.

Stein Atle Lie M.Sc. Ph.D., statistician
The Norwegian Arthroplasty Register, Department of Orthopaedics, Haukeland University Hospital, Bergen, Norway
Stein.Lie@unifob.uib.no

Blom A, Pattison G, Whitehouse S, Taylor A, Bannister G. Early death following primary total hip arthroplasty. An analysis of 1727 procedures. Acta Orthop 2006; 77: 347-50.

Lie S A, Engesaeter L B, Havelin L I, Gjessing H K, Vollset S E. Mortality after total hip replacement: 0-10-year follow-up of 39,543 patients in the Norwegian Arthroplasty Register. Acta Orthop Scand 2000; 71(1): 19-27.

Lie S A, Engesaeter L B, Havelin L I, Furnes O, Vollset S E. Early postoperative mortality after 67,548 total hip Replacements. Causes of death and thromboprophylaxis in 68 hospitals in Norway from 1987 to 1999. Acta Orthop Scand 2002; 73 (4): 392–9.