Discharges from hospitals to care homes: is there evidence of risk?

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Public Health Wales and Public Health Scotland have both analysed data on patient discharges (Emmerson et al 2020; Public Health Scotland 2020) and concluded that there was no 'significant' evidence of increased risk of care homes suffering an outbreak of covid-19 following such discharges. Both studies concluded that the biggest risk factor was the size of the care home, with larger homes at greater risk. A plausible interpretation was that this 'care home size' effect represented the risk of community transmission (from staff, deliveries or other contacts) for which no data was available.

Three elements of the research deserve scrutiny.

The first is the design of the research with possible measurement error of the exposure. Raw figures reported in the Welsh and Scottish studies revealed that care homes which had received patient discharges were between two and three times more likely to suffer a Covid outbreak (defined by having the first lab-confirmed case in a care home) than those without such discharges. The conclusions from statistical models that discharges did *not* significantly increase risk thus rested on how other factors that affect the risk of an outbreak were taken into account – especially the size of care homes, and the definition of the exposure period following a hospital discharge. We think alternatives to the design chosen should have been checked.

Both reports defined an 'exposure window' of 7-21 days after a hospital discharge and compared the Covid outbreak risks within and outside of this window. A sensitivity analysis was also conducted by varying the window sizes (0-31 days). However, a hospital discharge of an infectious asymptomatic Covid patient could be responsible for an outbreak occurring after the end of a specific exposure window. For example, the patient might first transmit the virus to other residents or staff who were also asymptomatic. As a result, a lab-confirmed symptomatic Covid case for defining the outbreak could occur later than the end of the study exposure window. Without knowing the actual mechanism of how a hospital discharge with infectious Covid influenced the outbreak risk, which possibly varied by care homes, using a universal window is likely to introduce errors in defining exposure periods. Besides, using this simple definition of exposure mixes up the infectious discharges with non-infectious discharges, which would likely dilute the effect of infectious hospital discharges intended to be estimated.

An alternative approach to defining the exposure and reducing exposure measurement error would be to look at the association between the number of the hospital discharges (cumulative exposure) and the risk of an outbreak, that is, as a 'dose-response' relationship. This is because the number of infectious discharges could be expected to increase with the number of total discharges. Thus, it would still be possible to catch the change of outbreak risk as the number of infectious discharges increased. In addition, in such a dose-response analysis, the reference time period for comparison would be the time period where no hospital discharge had ever occurred since the start of the pandemic, which would provide a 'clean' reference. We suspect that the methods used to control for care home size (which was identified as the strongest predictor of outbreak risk in these analyses) taken together with the way exposure was defined, may have had the effect of incorrectly attributing to care home size, some of the risk arising from the higher volume of discharges to larger homes. No single method is perfect, which makes it all the more desirable to repeat the analysis using different approaches to see what impact this has on results.

The second reason is the unfortunate use of the term 'significant' by both reports, and public statements about them. The use of thresholds such as 5% for statistical significance is a useful procedure, essential for weeding out lines of enquiry that are likely to prove fruitless. However, it carries an important caveat, especially when data is limited and numbers small. Failure to reach statistical significance is *not* proof of the absence of an effect. Rather it means that the size of effect

detected was smaller than would be needed to pass this (arbitrary) threshold. The best way to describe the status of unrejected null hypotheses has been the subject of discussion by statisticians ever since the original work of Fisher, but there is a consensus that failure to reject a null does not in itself constitute proof of its truth or validity. In fact, the best estimate from both the Welsh and Scottish studies was that hospital discharges *did* increase the risk of an outbreak considerably: by about 15-20%. Indeed, had the researchers asked a slightly more specific question: 'Did discharge ***increase*** the risk of an outbreak or not?' (i.e., using a one-tailed test) rather than the more general 'Did discharge **increase or decrease** the risk of an outbreak', the results in the Scottish study might well have been classed as statistically significant.

Statistical analyses ought to consider the costs and benefits of decisions that might follow from significance thresholds, as well as the thresholds themselves. Proceeding as if a risk from hospital discharge does not exist, because the evidence for it is not strong enough to pass a conventional threshold, would appear to be ill-advised, since the consequences of the risk – Covid outbreak in homes with frail elderly residents - are so serious.

Our third reason also relates to statistical significance. No report on this issue has been published by Public Health England. It would be desirable to undertake such a study, not only to investigate whether the situation there was similar to Wales and Scotland, but also because the much larger number of discharges and homes there would give a more definite answer to the question than has been possible from the relatively small numbers in Wales and Scotland.

Finally, there is another important point to note about the two studies. The research teams in Wales and Scotland found that the much of the data they needed for their study was not fit for purpose: records of discharges were commonly incomplete or wrong. This is alarming, but, unfortunately, unsurprising. It is alarming because data capture in the course of patient treatment is a vital resource for evidence-based medicine. It is unsurprising because good data recording is rarely a priority, least of all that of hard-pressed frontline staff doing their best to cope with an unprecedented medical emergency. Addressing this challenge ought to be a priority. Evidence-based medicine needs good patient records, not just to improve outcomes for patients in the future, but to tackle the pandemic now.

References

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