Appendix A: Capacity estimation

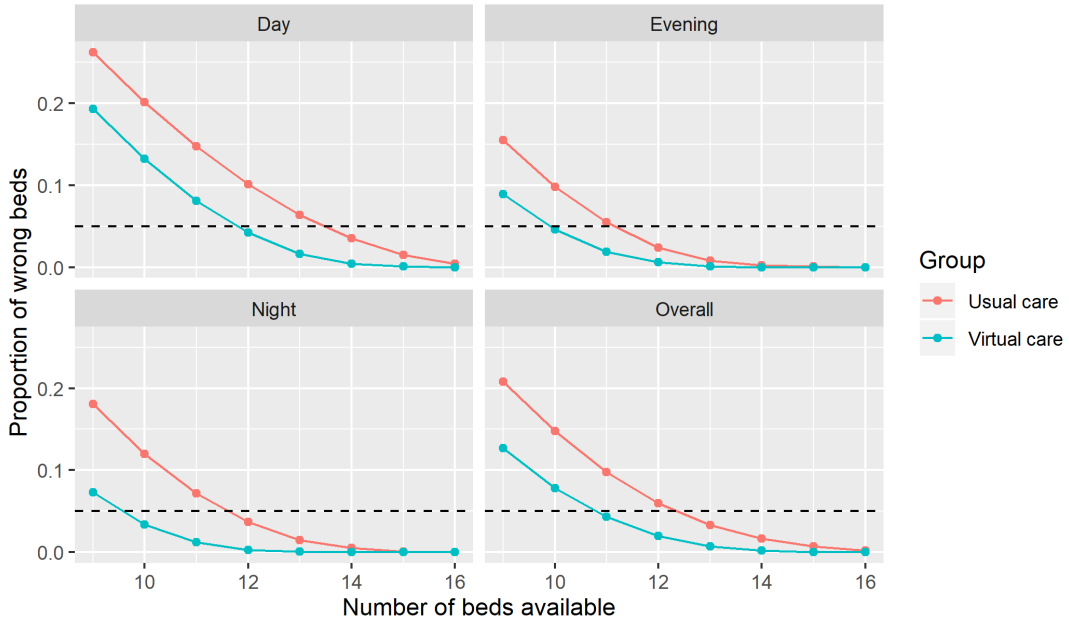
A pragmatic approach to capacity estimation is taken, using the method employed at the local hospital. This method requires admissions data of a ward for one year and the number of beds available to that ward as input. It then finds the number of patients treated by a ward for every hour of every day over the previous year, as well as the number of patients admitted to a different ward than the one providing treatment, i.e. the number of patients in "wrong beds". Patients end up in a wrong bed when all beds available to the treating ward are full. The proportion of patient time in wrong beds is computed to determine whether the number of beds available to the ward is appropriate. In this case, the maximum acceptable proportion of wrong beds is set to 0.05. Finally, the number of beds available to a ward is iterated to find the minimum number of beds needed to stay within the maximum acceptable proportion of wrong beds.
The hospital already works at reduced capacity in the months July and August, resulting in inaccurate capacity estimates for the rest of the year. Therefore, these months are excluded from the capacity estimation. Furthermore, for model stability, i.e. to ensure that the year does not start with an empty ward, admissions data for the last two months of the year before the year under investigation are also needed.
Finally, the reduction in number of beds needed is translated to a savings in nurse shifts by dividing the number of beds needed by the number of beds that can be served by a single nurse. During day shifts, one nurse serves 4 beds, during evening shifts one nurse is responsible for 6 beds, and during night shifts a single nurse serves 10 beds.

Scenario 1
As shown in Appendix Table 1, 13 beds are needed to restrict the number of bariatric surgery patients in wrong beds to an acceptable level with usual care, whichis reduced to 11 with virtual care.Therefore, with usual care, 3.5 nurse shifts are needed, while only 3 nurse shifts are needed with virtual care, resulting in a reduction of nurse shifts by 0.5.
As shown in Figure 1, the number of beds needed is reduced by two for each shift: from 14 to 12 during the day, and from 12 to 10 in the evening and the night. For evening and night shifts this does not result in a reduction in the number of nurse shifts needed, however. In the evening this is not possible because the number of beds is not sufficiently reduced, and during the night it is impossible because the ward already works with 1.5 nurse shifts, which is the minimum number of nurse shifts that should be available at any given time.

Appendix Table 1. Number of days bariatric surgery patients spend in wrong beds per year, based on number of beds available overall

	Usual care (3075 Bed days)		Virtual care (2660 Bed days)	
Beds	Wrong bed days	proportion wrong beds	Wrong bed days	proportion wrong beds
16	4,9	0,002	0	0,000
15	20,6	0,007	1,0	0,000
14	51,2	0,017	4,9	0,002
13	102,7	0,033	19,2	0,007
12	184,7	0,060	52,8	0,020
11	302,6	0,098	113,3	0,043
10	455,0	0,148	206,9	0,078
9	640,5	0,208	336,8	0,127

Peters GM, *et al. BMJ Open* 2022; 12:e051833. doi: 10.1136/bmjopen-2021-051833

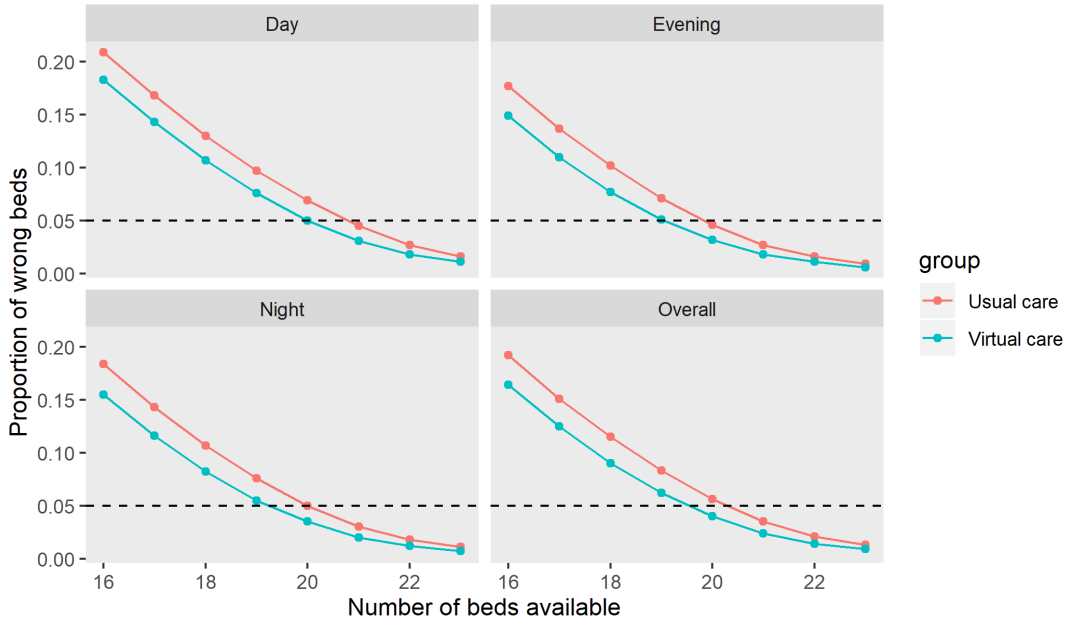


Scenario 2

As shown in Appendix Figure 2, 21 beds are needed to restrict the number of vascular surgery patients in wrong beds to an acceptable level with usual care, which is reduced to 20 with virtual care. Therefore, with usual care, 5.5 nurse shifts are needed, while only 5 nurse shifts are needed with virtual care, resulting in a reduction of nurse shifts by 0.5.

As shown in Figure 1, the number of beds needed is reduced by one for day and evening shifts: from 21 to 20 during the day, and from 20 to 19 in the evening. The number of beds needed during the night shift stays the same at 20. For the evening shift this does not result in a reduction in the number of nurse shifts needed, however, because the number of beds is not sufficiently reduced.

Appendix Figure 2. Number of beds needed for the vascular ward per shift with and without virtual care



Scenario 3

The weighted average percentage of eligible patients is 19.36%, resulting in 6400 eligible patients, and the weighted average reduction in length of stay is 1.20 days, resulting in savings of 7696.8 inpatient days. The weighted average number of saved inpatient days needed to reduce the number of nurse shifts by 1 is 619.28 days. Therefore, the number of nurse day shifts could be reduced by 7696.8 / 619.28 = 12.43 = 12 nurse shifts. Since nurse shifts during the evening and night could not be reduced in either scenario 1 or 2, it is assumed that this scenario also does not allow for this.

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