

NIHR | Applied Research Collaboration
Wessex

ARC Wessex **BITES**

Flexible nurse staffing on hospital units: the cost and consequences of different strategies – a simulation modelling study

Published: March 2021

doi: <https://doi.org/10.1016/j.ijnurstu.2021.103901>

What's the issue?

In the face of pressure to contain costs and make best use of scarce nurses, flexible staff deployment (floating staff between units and temporary hires) guided by a patient classification system may appear an efficient approach to meeting variable demand for care in hospitals.

- Staffing decisions for hospital wards need to address both the baseline staff establishment to roster, and how best to respond to fluctuating demand as patient census and care needs vary
- Flexible deployment of staff, including floating staff and using temporary hires, has the potential to minimise expenditure while meeting varying patient need, but high use of temporary staff may be associated with adverse outcomes.
- Finding the right balance between baseline staff levels and flexible response to meet patient need is a significant challenge

What's new?

We studied the cost-effectiveness of different approaches to planning baseline numbers of nurses to roster on general medical/surgical units while using flexible staff to respond to fluctuating demand.

We developed an agent-based computer simulation model, where units move between being understaffed, adequately staffed or overstaffed as staff supply and demand, measured by the Safer Nursing Care Tool, varies. Staffing shortfalls are addressed firstly by floating staff from overstaffed units, secondly by hiring temporary staff.

We compared a standard staffing plan (baseline rosters set to match average demand) with a 'resilient' plan set to match higher demand, and a 'flexible' plan, set at a lower level. We varied assumptions about temporary staff availability.

We estimated the effect of unresolved low staffing on length of stay and death, calculating cost per life saved.

The most important themes to emerge from the simulation results were:

- Staffing plans with higher baseline rosters led to higher costs but improved outcomes.
- Cost savings from low baseline staff largely arose because shifts were left understaffed due to limited availability of temporary staff, which increases risks to patients.
- Much of the cost saving from low baseline staff levels are offset by an increased length of stay linked to low staffing
- If there is a high availability of temporary staff the cost savings from lower baseline staff were substantially reduced but adverse effects were not eliminated.
- With limited temporary staff available the standard plan cost £ 13,117 per life saved compared to the flexible (low baseline) plan and with unlimited temporary staff available the standard plan cost just £ 4520 per life saved.
- Cost-effectiveness of higher baseline staffing was even more favourable when negative effects of high temporary staffing were modelled and with unlimited temporary staff available the standard staffing plan cost just £ 515 per life saved compared to the 'flexible' (low baseline) plan.
- The flexible plan is a disinvestment in nursing which is not supported by these findings.
- Similar results were obtained for the cost-effectiveness of the higher baseline 'resilient' staffing plan compared to the standard plan so baseline staffing at higher than current levels might be judged cost-effective.

Why is this important?

Flexible staffing can be guided by shift-by-shift measurement of patient demand, but proper attention must be given to ensure that the baseline number of staff rostered is sufficient.

In the face of staff shortages, low baseline staff rosters with high use of flexible staff on hospital wards is not an efficient or effective use of nurses whereas high baseline rosters may be cost-effective.

Flexible staffing plans that minimise the number of nurses routinely rostered are likely to harm patients because temporary staff may not be available at short notice.

- Our simulation shows that low baseline staff rosters that rely heavily on flexible staff increase the risk of patient death and provide cost savings largely because wards are often left short staffed under real world availability of temporary staff.
- A staffing plan set to meet average demand appears to be cost effective compared to a plan with a lower baseline but is still associated with frequent short staffing despite the use of flexible deployments.
- A staffing plan with a higher baseline, set to meet demand 90% of the time, is more resilient in the face of variation and may be highly cost effective

You may be interested to read

1. Griffiths, P., Saville, C., Ball, J., Jones, J., Pattison, N., Monks, T., 2020. Nursing workload, nurse staffing methodologies and tools: A systematic scoping review and discussion. *International Journal of Nursing Studies* 103, 103487. <https://doi.org/10.1016/j.ijnurstu.2019.103487>
2. Aiken, L.H., Sloane, D.M., Bruyneel, L., Van den Heede, K., Griffiths, P., Busse, R., Diomidous, M., Kinnunen, J., Kozka, M., Lesaffre, E., McHugh, M.D., Moreno-Casbas, M.T., Rafferty, A.M., Schwendimann, R., Scott, P.A., Tishelman, C., van Achterberg, T., Sermeus, W., consortium, R.C., 2014. Nurse staffing and education and hospital mortality in nine European countries: a retrospective observational study. *Lancet* 383 (9931), 1824-1830. [https://doi.org/10.1016/S0140-6736\(13\)62631-8](https://doi.org/10.1016/S0140-6736(13)62631-8)
3. Bridges, J., Griffiths, P., Oliver, E., Pickering, R.M., 2019. Hospital nurse staffing and staff-patient interactions: an observational study. *BMJ Qual Saf* 28 (9), 706–713. <http://dx.doi.org/10.1136/bmjqs-2018-008948>
4. Dall'Ora, C., Maruotti, A., Griffiths, P., 2019. . Temporary staffing and patient death in acute care hospitals: A retrospective longitudinal study. *Journal of Nursing Scholarship*, 52 (2), 210-216 [10.1111/jnu.12537](https://doi.org/10.1111/jnu.12537). [10.1111/jnu.12537](https://doi.org/10.1111/jnu.12537)
5. Griffiths, P., Maruotti, A., Recio Saucedo, A., Redfern, O.C., Ball, J.E., Briggs, J., Dall'Ora, C., Schmidt, P.E., Smith, G.B., Missed Care Study, G., 2019. Nurse staffing, nursing assistants and hospital mortality: retrospective longitudinal cohort study. *BMJ Qual Saf* 28 (8), 609-617. <http://dx.doi.org/10.1136/bmjqs-2018-008043>

Funding

This research presents independent research funded by the UK National Institute for Health Research (NIHR) Health Services and Delivery Research Programme (award number 14/194/21).

Authors

[Peter Griffiths](#), [Christina Saville](#), [Jane E Ball](#), [Jeremy Jones](#), [Thomas Monks](#)

Peter Griffiths^{123*},

Christina Saville¹²,

Jane E Ball¹²,

Jeremy Jones¹,

Thomas Monks⁴ and **On behalf of the Safer Nursing Care Team study team**

¹Health Sciences, University of Southampton, UK

²National Institute for Health Research Applied Research Collaboration (Wessex), Southampton, UK

³Portsmouth Hospitals University NHS Trust, UK

⁴University of Exeter, UK

* Corresponding author; email: peter.griffiths@soton.ac.uk

<https://www.arc-wx.nihr.ac.uk>

https://twitter.com/arc_wessex