Letters to the editor

Comment on the MedNav decision support system

Editor – I read with interest the paper by Duffy *et al* on the MedNav decision support system for helping midwives manage neonatal resuscitation in poor resource settings.[1] Unfortunately the clinical flow diagram in Fig 1 contains numerous, serious structural and logical errors some of which are described below.

> Although the baby's heart rate is assessed, there is no input of heart rate data into the algorithm.
> There is no assessment and input of the baby's muscle tone into the algorithm.
> The algorithm will fail to pick up a baby with normal breathing that might need resuscitation if its heart rate is abnormal or its tone is abnormal (ie is floppy) or both.
> This algorithm will always decide that that the baby has airway obstruction due to meconium (Fig 1 inset) which is erroneous.

I have redesigned this part of the flow diagram to show the correct logic (Fig 1).

> In the bottom left-hand corner of the algorithm the diamond-shaped box containing the words 'If visualisation selected' followed by the same words in a rectangular box does not make sense. By convention, *processes* should appear in rectangular boxes and *decisions* in diamond-shaped boxes.[2,3]
> When the baby's breathing is satisfactory the algorithm will terminate before assessment of the baby's heart rate.
> The question 'HR from >60 to <60 bpm?' in the diamond-shaped box in the cardiac resuscitation part of the diagram does not make sense so the algorithm will fail here.
> The word 'Done' appears throughout the flow diagram. Although this word may appear on the computer screen, it is not *conventional* to show it in the flow chart describing the software.

While I admire the authors' diligent work on this project, designing complex, time-based, multivariable, clinical flow charts like this one is fraught with difficulties and I have so far identified 20 different types of error in this mode of graphical communication.[4] I hope that the flow diagram in the original paper is a poor representation of the *actual* data flow and logic in the production software for the sake of patient safety. ∎
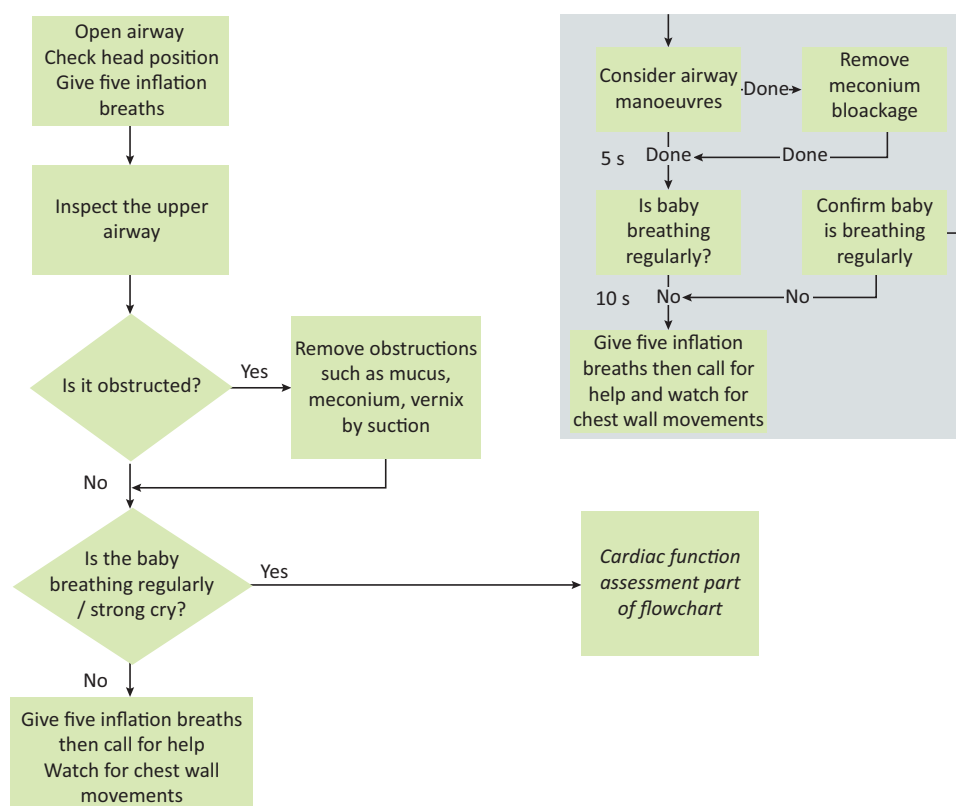

Fig 1. The redesigned part of the flow diagram illustrating the logic of upper airway assessment. Inset shows part of the original diagram.[1]

Conflicts of interest

The author has no conflict of interest to declare.

References

1 Duffy S, MacLaren E, Phillips D, Letchworth P. MedNav – helping midwives manage neonatal resuscitation in resource poor settings. *Future Healthcare Journal* 2017;4:178–83.
2 Colman A, Richards B. Clinical algorithms should be standardised. *BMJ* 1993;443:307.
3 Society for Medical Decision Making, Committee on Standardization of Clinical Algorithms. Proposal for Clinical Algorithm Standards. *Med Decis Making* 1992;12:149–54.
4 Colman A, Richards B. Clinical Algorithms: purpose, content, rules, and benefits. *International Journal on Biomedicine and Healthcare* 2014;2:28–40.

ANDREW COLMAN
Post-doctoral clinical computer scientist and physician,
Newcastle University, Newcastle, UK

Response

We welcome the enquiries about our MedNav neonatal resuscitation navigation and we would like to thank the correspondent's comments and suggestions to improve our decision support system.

The protocol we use does not need specific heart rates put into the system in order to work; however, it does need the user to confirm three options for the heart rate of the baby. The protocol as the correspondent has noted is not dependent on the tone of the baby initially; however, at 5 and 10 minutes we do ask the user about the tone of the baby (not in flow diagram). The correspondent mentions that the algorithm will fail to pick up a baby with normal breathing that might need resuscitation if the heart rate is abnormal or its tone is abnormal or both. In our clinical experience if a baby has normal breathing / crying, the heart rate is not a concern and it is not normally assessed in clinical practice; however, the software has a specialist button that can be accessed for rare or specialist cases (not included in the flow diagram) and the final prompt is to warm, monitor and consider oxygen if necessary. We have updated the flow diagram for obstructed airways and several options now exist.

Our MedNav decision support tool for neonatal resuscitation is improving performance and as part of our ongoing research we have implement several iterations of the protocol to improve performance further. We welcome further comments and we look forward to continuing our work in this area. ■

SHANE DUFFY
Consultant obstetrician and gynaecologist,
Director, MedNav

Transformative change requires statistical evidence

Editor – With the ubiquitous use of smart phone technology I welcome the introduction of technology that potentially improves access to the NHS for our patients. The paper by Bartlett *et al* provides an engaging description of the use of a smartphone-based platform aiming to improve 'did not attend' (DNA) rates.[1]

Complex systems vary over time so it is important that sufficient information is provided for the reader to be able to determine whether the DNA rates described in the paper simply changed over time or were improved. The application of a validated statistical framework such as Statistical Process Control (SPC) would allow differentiation between non-significant change and statistically significant improvement.[2,3] In addition, by analysis of the temporal relationship between the intervention and improvement, correlation or causation can be determined.

It is important, as clinicians, that we apply the same statistical rigour to determine the benefit of innovative system technologies as we would to the use of a new medication or surgical technique. ■

Conflicts of interest

TD is on the editorial board of *Future Healthcare Journal*.

TOM DOWNES
Clinical lead for quality improvement,
Sheffield Teaching Hospitals, Sheffield, UK

References

1 Bartlett M, Blazer S, Hobson G, Abbs I. The power of digital communications: improving outpatient attendances in south London. *Future Healthcare Journal* 2018;5:43–6.
2 Mohammed M. Using statistical process control to improve the quality of healthcare. *Qual Saf Health Care* 2004;13:243–5.
3 Thor J, Lundberg J, Ask J *et al*. Application of statistical process control in healthcare improvement: systematic review. *Qual Saf Health Care* 2007;16:387–99.

Response

Thank you for your letter. We agree, that in order to drive and refine the adoption of digital innovation across healthcare it is important to use rigour when carrying out benefits analysis.[1] We are committed to demonstrating a causal relationship between intervention to outcome rather than just correlation.

Statistical analysis on the effectiveness of reminder services has been demonstrated in multiple studies using a variety of different methodologies. We recommend the TURNUP study for a comprehensive meta-analysis of studies in this field.[2]

There is no common consensus on an optimal framework to use; however, there are many which could be applicable. These include Statistical Process Control, those discussed in the World Health Organization[3] and those being developed by the European Union.[4] DrDoctor is in the process of evaluating approaches to apply to our data to better understand the impact of our technology and services, and to drive further improvements.

DrDoctor currently works with 10 partner NHS trusts in a variety of geographies across the UK. This has given us 6.5 million data points to power statistical analyses exploring the impact of multiple confounders on DNA rates. These confounders include regional, seasonality, weather, specialty and other hospital operational initiatives. We are in the process of collating this data and currently reviewing different frameworks for analysis, with the intention of future publications. ■

References

1 Car J, Black A, Anandan C *et al*. The impact of eHealth on the quality and safety of healthcare: a systematic overview. *PLoS Med* 2011;8:e1000387
2 McLean SM, Booth A, Gee M *et al*. Appointment reminder systems are effective but not optimal: results of a systematic review and evidence synthesis employing realist principles. *Patient Prefer Adherence* 2016;10:479–99.
3 World Health Organization. *Monitoring and Evaluating Digital Health Interventions: a practical guide to conducting research and assessment*. WHO, 2016.
4 *Request for an opinion: Assessing the impact of digital transformation of health service*s. (2018). European Commission, 2018.