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After graduating with a degree in Pharmacology in 2002, Helen qualified as a RVN in 2005. She began a nine-year stint as a locum nurse working nationally and internationally, developing experience in referral medicine and surgery, charity practice, emergency nursing and exotics. During this time she spent five years on BVNA council in a variety of roles, culminating in her being awarded honorary membership in 2016.

In 2013 she qualified as a human-centred nurse, after two years working on intensive care, she moved to the transplant team supporting patient's pre- and post-transplant. Currently she works at Addenbrookes Hospital, Cambridge on the Transplant High Dependency Unit.

Helen remains a Registered Veterinary Nurse and has developed a strong interest in the principles of One Health and chairs the Veterinary Nursing Futures One Health Committee. She regularly lectures and writes about concepts and ways of working that may be shared between the professions to support clinical and professional practice. Her first textbook, on Veterinary Nursing Care Plans, was published earlier this year. She is currently working on an MSc in Healthcare Management.

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Using checklists in veterinary nursing: what can human healthcare teach us?

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ABSTRACT: Checklists are used regularly throughout human-centred healthcare. There is a wide range of data available to support the use of checklists across varied healthcare disciplines. Checklists have been credited with improving teamwork and communication, addressing human factors to support performance, prevention of errors and supporting a culture of patient safety. This article will consider if such benefits may be transferable to veterinary nursing. It will outline the principles of using a checklist, the perceived benefits of the checklist and the factors that should be considered when designing an effective checklist.

Keywords: One Health; checklists; human factors; communication; patient safety; teamwork

The use of checklists is widespread throughout human-centred healthcare. Probably the best known checklist used in healthcare generally is the World Health Organisation Surgical Safety Checklist (SSC), originally mandated for use in the National Health Service (NHS) in 2010 by the Patient Safety Agency. The SSC has been credited with improving surgical outcomes across the world (Haynes, Weiser, & Berry, 2009; Fudickar, Horle, Wiltfang, and Bein, 2012).

The implementation of checklists within human-centred healthcare is as a result of learning from a group of industries known as "High Reliability", often referred to as HROs (high-reliability organisations). Examples include the aviation and aerospace industry, nuclear power production, firefighting, some military operations and engineering. HROs perform hazardous and complex operations with exceptionally low failure rates (Hales & Pronovost, 2006).

HROs use checklists both as cognitive aids to free up mental capacity for the operation in hand and to try and prevent human error (Thomassen, Espeland, Søfteland, Lossius, Heltne, & Brattebø, 2011). Humans are prone to short-term

memory loss, particularly in times of stress, distraction or fatigue (Kuhlmann, Piel, & Wolf, 2005). This may be compounded by the fact that many medical procedures rely on an individual's memory. The potential for error is high.

The use of checklists in healthcare has been dynamically championed by Atwul Gwande. Within his best-selling book *The Checklist Manifesto* (Gwande, 2010), he describes how pilots, encountering potentially life-threatening situations while flying planes, turn to checklists to organise their thoughts and ensure all correct procedures have taken place. Within aviation, checklists can be broadly divided into an instruction to do something, to prompt cognitive function, or a confirmation that work has been done, which acts as a support should things not be going as expected. Generally the primary principle of a checklist is the introduction of high redundancy, which supports the use of duplication to highlight safety and make a system more reliable, potentially resulting in fewer mistakes and better outcomes.

There has been a great deal of discussion about how the use of checklists has improved patient outcomes. One explanation is that the use of the checklist

supports effective teamwork through consideration of human factors, standardisation of procedures and promotion of a culture of patient safety (Pugel, Simianu, Flum, & Dellinger, 2015).

Taking a human factors approach to patient safety involves considering the factors related to both people and environments that affect the way work is carried out (RCN 2017). Promoting effective communication and team-working is a crucial element of addressing human factors. In the UK there are many large hospitals, which may employ ten thousand people, making no account for visiting or locum staff. In such environments, it can be common for teams of professionals to be working together in settings that are new to them with team members they have not met before. This can hinder clear communication and instructions. A dominant hierarchy of experience or qualification may also prevent open communication. Junior members of the team may be loath to challenge, or even speak to those they perceive as senior to them. When root cause analysis is carried out on mistakes in healthcare, communication is commonly cited as a cause; in some cases staff members have been known to have notice the mistake, but felt unable to communicate it, or have simply not been heard (Bromiley & Mitchell, 2009).

A checklist can promote open communication and may actively promote clear introductions between staff members. A checklist may be used and led by all levels of staff, and potentially to maximise the positive effect of team-working, a checklist should be led by junior members of the team as often as it is led by seniors. Furthermore, checklists have been demonstrated in HROs to help offset the disruption to cognitive function caused by stress, fatigue or distraction (Thomassen et al., 2011).

Standardisation, often outlining a core set of patient safety checks and the introduction of high-redundancy techniques that support the use of duplication to highlight safety, can make systems more reliable. High redundancy may serve to promote a culture of patient safety within the working environment generally through repeated exposure to the subject. The pre-operative checklist completed by ward staff before a patient is transferred by another member of staff to the theatre is a clear example of a high-redundancy technique. Patients are asked questions about their identity, their medication history and when they last ate and drank,

among others. Many of these questions will have already been asked by an attending anaesthetist and surgeon doing their pre-operative visits and obtaining consent. Repeating these checks emphasises the importance of them and minimises error.

The promotion of a culture of safety is also supported by the measurement of the impact of the checklists. Audit and improvement of such procedures ensure that they are frequently at the front of staff minds and conversations are held around adapting and improving checklists to ensure they are working for both staff and patients.

Given the benefits of checklists described, a crucial question is, are these well-documented benefits likely to extend to veterinary nursing? Taking each of the benefits of the use of checklist in turn, it is possible to apply them to veterinary nursing and evaluate whether the same benefits may apply. Human factors are universal; many complex and high-risk veterinary nursing procedures may rely on one individual's memory to perform them. Consider the setting up of a ventilator, an isolation kennel for a dog with a potentially zoonotic disease, or an emergency resuscitation situation. Stress, anxiety, fatigue and distraction may all cause memory loss and increase the likelihood of error. The use of a checklist could prevent this.

The communication benefits are potentially a little more tenuous. There are few veterinary hospitals that are as big as human-centred hospitals, and consequently numbers of staff are lower. The author has previously commented on relationships between veterinary surgeons and veterinary nurses being closer than between doctors and nurses, both in terms of communication and in geography (Ballantyne, 2015). It can be assumed that staff within a smaller team are much more likely to know each other, have worked with each other before and be working within familiar environments. Therefore, as such, this particular benefit of checklists is less likely to be evidenced within veterinary nursing.

Standardisation and high-redundancy techniques are likely to benefit veterinary nursing and potentially reduce errors. Repetitive checks may have the potential to reduce errors both by highlighting the importance of the information being communicated, but also by raising the profile of patient safety in general. This may be further supported, as in human-centred healthcare, through ongoing audit and

monitoring, keeping the subject high in the minds of all staff members.

If it might be assumed that at least some of the documented benefits of checklists may be transferrable to veterinary nursing, when might they be applied? There are four key areas where a checklist may be useful to the veterinary nursing team.

1. High-stress procedures.
2. Highly complex procedures.
3. Areas of work where there are known existing repetitive errors.
4. High-importance work.

High-stress procedures

A clear example of a potential use of checklist within this category would be the designing of a checklist to support the admission and initial stabilisation of an emergency patient. Consider the stress involved with such a case. Potentially it could be a critical condition that staff do not see very often, such as a gastric dilatation volvulus or caesarean section. It could be a presentation that nobody has ever seen before: consider a trauma involving a stabbing or accident resulting in widespread injuries. Staff are likely to be feeling anxious and therefore may struggle to remember what to do and when to do it. There is also likely to be the added challenge of a distressed owner who may require just as much emotional support as the animal requires nursing support. Finally, consider that this presentation may involve a limited staff team. Out of hours, it may be only one nurse and one vet on call, who may already be stretched with existing in-patient care. The use of a checklist to direct work might be invaluable to offset the potential for short-term memory loss induced by the high-stress situation.

Highly complex procedures

Recently, the World Health Organisation declared that "Chronic conditions are the leading cause of mortality and morbidity across Europe" (Busse, Blümel, Scheller-Kreinsen, & Zentner, 2010). It is clear that the horizon of healthcare within human-centred nursing is changing. Increasingly, patients have comorbidities which present an extra layer of complexity to their treatment. It is not unrealistic to assume the same applies in veterinary nursing.

Therefore, using a checklist to ensure that the core principles of a procedure or

operation have been addressed can free up cognitive function for the operation. Consider an elderly cat with chronic kidney disease and a heart murmur who needs a dental under a general anaesthetic. There are multiple considerations to take into account when planning and performing this procedure. Using a checklist to ensure that equipment is checked and the relevant monitoring is in place allows the nurse brain space to consider extra factors, such as fluid therapy in the context of a patient with renal and cardiac compromise. Should the procedure take longer than necessary or the patient begin to struggle, the nurse may be secure that key interventions are in place and can think laterally about the specific problem they are presented with.

Areas of work where there are known to be repeated existing errors

Veterinary practice in the UK is often a private business and, as such, there may be related elements of a veterinary nurse's role that he or she may not like or be very good at. Record keeping, or specifically billing when services or products are used, may be one example where errors may repeat. It is easy to forget to add a can of food or wound dressings to a patient's bill. The use of a checklist, potentially put in place for retrospective use, can support the checking of a bill for errors and highlight areas that require attention. It acts as a stimulus to check everything has been recorded appropriately. In this case, the checklist is used to confirm the relevant work has been done, rather than to instruct work.

High-importance areas

While it might be suggested that all the examples mentioned are of high importance, this particular category links to small yet significant actions that are easy to miss and if missed may have catastrophic consequences. Checklists within this category are likely to be short, simple and applicable to a large number of patients. They may be particularly relevant to a specific task that is performed many times a day, a task that may seem simple and therefore vulnerable to distraction or interruption. The classic example would be neutering, and performing checks that confirm both the identification of the animal and the sex. Simple tasks, but if missed they could result in catastrophic

outcomes, the mistaken neutering of an animal that wasn't admitted for neutering, or the anaesthetising and preparation of a female cat that turns out to be a male on closer examination. In both cases, a checklist before bringing the patient to the theatre might have prevented the mistake.

What makes a good checklist?

There are several aspects of a checklist that will render it more effective and more likely to support staff rather than become an object of resentment, which any change in existing practice has the potential to be. There are three elements to consider when creating an effective checklist: knowledge of the procedure, knowledge of the stakeholders involved and implementation strategy.

Knowing and understanding the procedure is essential to writing an effective checklist. It shouldn't be a list of everything that must be done for every procedure. There needs to be comprehension of what elements of the procedure are automatic and which require attention. Evidence suggests that checklists may be more useful if they are associated with a specific task outcome, a number or a familiar value, as opposed to tick or cross value. Furthermore, there is need to understand the logistics of the procedure. If it is related to an emergency admission, where should the checklist be stored? How should it be presented? Would lighting prohibit easy reading of a laminated presentation? If during the situation staff are likely to have their hands full with patient, equipment and or owner, should the checklist be on the wall?

Such considerations should be combined with knowledge of the stakeholders, those who have an interest in the checklist. A checklist may assign tasks, which needs to be appropriate to the people involved. They should be involved in writing the checklist, trialling it and ensuring that the language is familiar and accessible.

Finally, the way the checklist is implemented will be the ultimate test of whether it becomes an essential tool that supports patient safety and supports effective teamwork, or a dusty sheet of paper that nobody looks at anymore. More recently, some of the excellent results associated with the surgical safety checklist have been challenged. It is acknowledged that the checklist has the potential to decrease mortality and morbidity, but

it has proved difficult to replicate the original positive results of the some of the initial studies (Tang, Ranmuthugala, & Cunningham, 2014). While the checklist itself is effective, the implementation has proven challenging. Evidence suggests that it requires high-level leadership, comprehensive training and detailed data collection, audit and monitoring (Bosk, Dixon-Woods, Goeschel, & Pronovost, 2009). Without that, the positive effects of the use of checklists are impossible to reproduce.

Conclusion

One of the pillars of One Health, the collaborative consideration of the health of animals, people and the environment, is cross-professional learning. Learning lessons from the triumphs and failures of other professions can support innovation and improved outcomes.

The use of checklists within veterinary nursing is one such example. After examination of the use of checklists within human-centred healthcare, some of the benefits documented may be extrapolated to veterinary nursing. Particular benefits may apply when checklists are used in highly stressful, highly complex or high-importance areas of practice. There might also be benefits if checklists are applied to areas of work where there is a known history of frequent errors.

It is important to always think critically during cross-professional learning. There are unique pressures and priorities that must be taken into account in every profession and as such assumption of benefit or failure should never be made.

Disclosure statement

No potential conflict of interest was reported by the author.

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