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Katie qualified and registered with the RCVS in 2012 after studying at MYF in Aldershot. Shortly after registering, Katie started working as a Surgery Nurse at the Queen Mother Hospital for Animals at the Royal Veterinary College. With her main interests in critical care, Katie transferred to the Emergency and Critical Care Department of the QMHA in 2013. Katie has recently graduated from Harper Adams University with the Advanced Diploma in Veterinary Nursing, and is appointed as a Senior ECC Nurse helping to lead the team of over 30 Specialist RVNs.

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Introduction of a sepsis bundle in the ICU and ER: a case-based discussion

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ABSTRACT: Systemic Inflammatory Response Syndrome (SIRS) and Sepsis are encountered in veterinary practice daily. However, there are few tools available for use by veterinary professionals to enable them to quickly recognise the syndromes. After research into Sepsis Care bundles available to human hospital staff, the observer has become more aware of how to recognise the condition whilst in the Intensive Care Unit (ICU). After developing a Veterinary Sepsis Care Bundle (VSCB), it was put into place in ICU. Following the discussion, it was revealed that survival rates were slightly improved following introduction of the VSCB. Similar percentages of patients were administered antibiotic therapy within three hours of admission, before and after the bundle was introduced. It was appreciated that a large percentage of all patients situated in ICU are affected somewhere between SIRS and Septic Shock. The VSCB introduced to ICU provided a reminder to staff of early recognition and management.

Ethical considerations

The aim of the audit was to compare treatment given to septic patients in the ICU at the Queen Mother Hospital for Animals (QMHA). Data were collected prior to the introduction of a Veterinary Sepsis Care Bundle (VSCB) and after the introduction of the bundle. As this was a retrospective collection of data it was classified as an audit, an application was sent to the Ethics Committee at the Royal Veterinary College, and approval was given to use the data.

Bundles

Sepsis 6

The Sepsis 6 bundle was created to prompt medical professionals to start treatment for sepsis within 6 hours from admission to hospital. The bundle included administering high-flow-rate oxygen, taking blood cultures, administering broad-spectrum antibiotics, administering intravenous fluid therapy (IVFT), measuring serum lactate levels and haemoglobin, and accurately measuring urine output (UOP) (Bentley, Henderson, Thakore, Donald, & Wang, 2016).

During an audit of data collected by Bentley et al. (2016), interventions were used to ensure highest levels of compliance to sepsis 6. Discussions regarding Early Goal Directed Therapy (EGDT) in management of these cases, and mandatory training courses run by the lead consultant were given to all junior doctors. These training courses were on SIRS, Sepsis and identifying diagnostic criteria for increasing severity of sepsis. Training was provided to all nurses and every month an audit was carried out, with results being sent to all staff regarding compliance to the bundle in septic patients. It concluded that after the above interventions took place, compliance increased by 45.7%.

Sepsis 3

Sepsis 3 is the most up-to-date bundle by the European Society of Intensive Care Medicine and the Society of Critical Care Medicine. Based on their new definition of sepsis it is now recommended that a sepsis bundle is followed within 3 hours of admission for those with organ dysfunction, followed up by completion of the 6-hour bundle (Silverstein, 2016). A new term SOFA – Sequential Organ Failure Assessment – was developed to replace SIRS in the human medical field. Human patients can now be assessed on these criteria and

Graph 1 - Percentage Fluid Samples/Blood Cultures taken prior to Bundle introduction

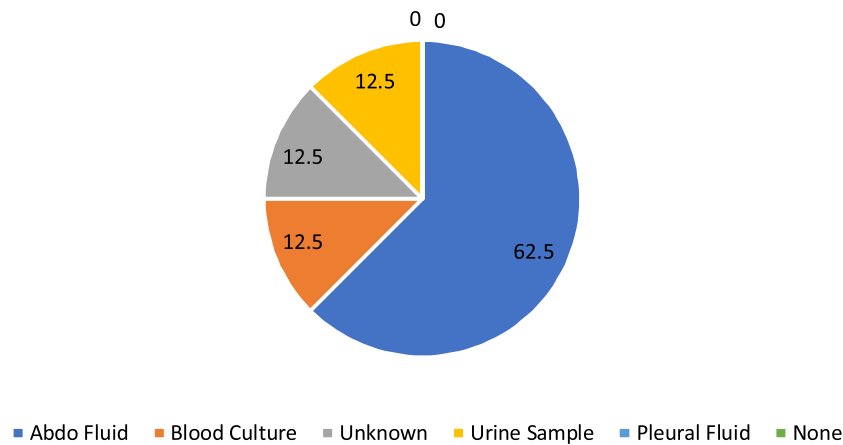


Figure 1. Percentage of samples taken before VSCB

Percentage of Survival in Patients Before and After VSCB Introduction to ICU

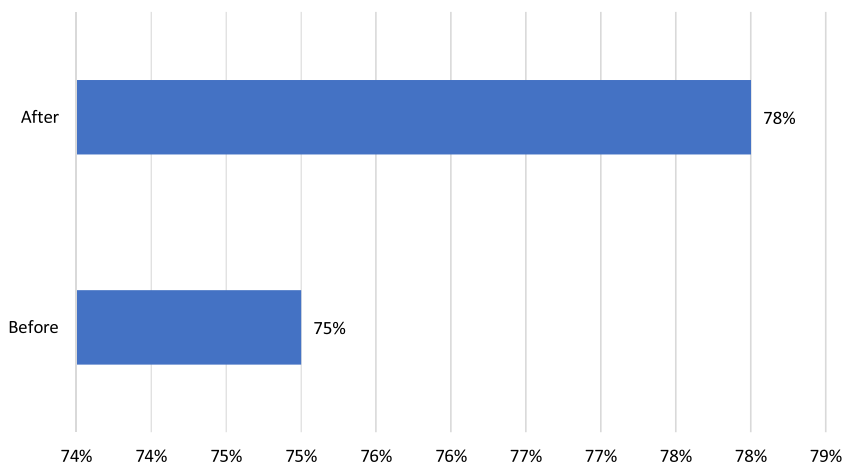


Figure 2. Survival percentages

Graph 2 - Percentage Fluid Samples/Blood Cultures taken after introduction of bundle

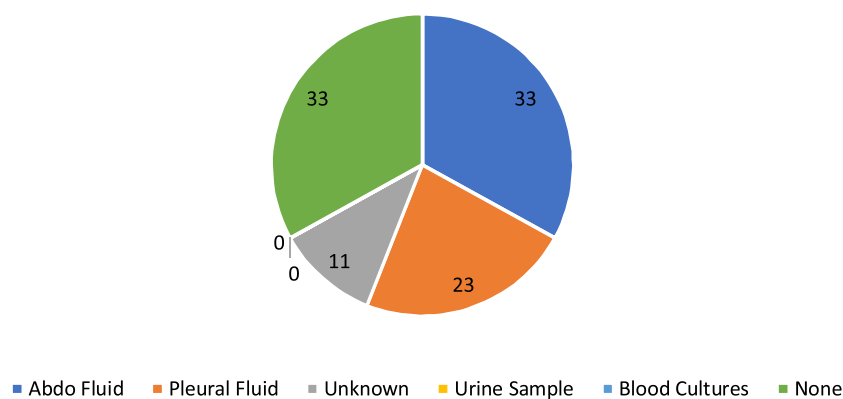


Figure 3. Percentage of samples taken after VSCB

are given a SOFA score to determine how critical they are. Silverstein (2016) points out that although this is new for human patients, for our veterinary patients an indication of

SIRS remains a good marker in highlighting critically unwell animals.

As there is no Veterinary Sepsis Care Bundle (VSCB) yet available, a bundle was developed (see Appendix) specifically for

dogs and cats using clinical parameters from Hauptman and Waltshaw (1997) (see Table 1), Savigny (2006) and from discussions with Intensivists in the ICU (Humm, 2016, personal communication).

The bundle was sent to all staff involved in triage and admission of patients through to the ICU and laminated copies were displayed on the walls. Once the bundle was distributed, data were collected from septic patients admitted and compared to the data collected prior to distribution of the bundle.

Data discussion

There were eight patients prior to introduction of the bundle whose data were collected and nine after the bundle was introduced. Of the 17 patients audited, 82.3% (14/17) were dogs and only 17.6% (3/17) were cats; 41.2% (7/17) were geriatric (over 8 years of age), 53% (9/17) were adult between the ages of 18 months and 8 years and only 5.8% (1/17) was paediatric at 6 weeks old.

The data collected from each patient included initial observations upon arriving at the hospital (Table 2). If they were in the hospital for a few days prior to becoming septic for a second time, the data collected were the initial observations that indicated they were becoming septic again. In the first set of patients, two patients developed sepsis for a second time while hospitalised, and so these patients are counted twice with their separate observations.

Prior to the bundle, 87.5% (7/8) of patients had fluid samples or blood cultures taken on arrival at the hospital (Figure 1) and before antibiotic therapy was started in order to diagnose sepsis. The remaining patient did not have any sampling documented. Abdominocentesis was performed in 62.5% (5/8) of these patients, followed by blood cultures in 12.5% (1/8) and urine cultures in 12.5% (1/8).

Before the bundle, 75% (12/16) of cases were started on broad-spectrum antibiotic therapy within 3 hours of presentation to the hospital.

The survival rate of the patients admitted prior to the sepsis bundle was 75% (6/8), compared to 78% (7/9) after the VSCB introduction (Figure 2). Of all 17 patients sampled, 17.6% (3/17) suffered cardio-pulmonary arrest and died as a result of sepsis/septic shock.

Of patients sampled after the introduction of the bundle, 44% (4/9) had fluid samples or blood cultures taken for diagnosis prior to broad-spectrum antibiotic therapy (Figure 3). Due to there being no documented sampling on the remaining five

Table 1. SIRS criteria for dogs and cats

	Dogs (at least 2 or more)	Cats (at least 3 or more)
Temperature (°C)	< 37.2°C	< 37.2°C
	> 39.4°C	> 39.4°C
Heart rate (beats per minute)	> 120	> 220
		< 140
Respiratory rate (resps per minute)	> 24	> 40
White blood cell count ($\times 10^3$) (% of bands)	< 6	< 6
	> 16	> 20
	10% bands	

Source: Adapted from Hauptman and Waltshaw (1997).

Table 2. Audited patient data

	Species	Life stage	Temp °C	Heart rate	Respiratory rate	Blood pressure	Lactate	Blood glucose
1	Dog	Geriatric	38.3	120	32	100		2
2	Dog	Adult	38.8	120	44	164		
2	Dog	Adult	38.7	150	48	100	4.5	8
3	Dog	Adult	39.9	100	Panting			5.9
4	Dog	Geriatric	39	210	40	170	1.2	9.2
5	Dog	Adult	39.8	156	48	120	4.8	4.8
6	Dog	Geriatric	37	120	20	100	0.5	5.7
6	Dog	Geriatric	37.6	160	44	86	3.7	2.2
7	Dog	Geriatric	37.6	140	36		1.6	8.1
8	Dog	Adult	39.8	120	44	108	1.6	13.4
9	Cat	Adult	36.9	164	20	88	0.5	9.3
10	Cat	Adult	40.4	156	40		2.4	8.1
11	Dog	Paediatric	37.6	80	24	60	0.5	10.8
12	Dog	Adult	40.1	110	60		1.6	4
13	Dog	Geriatric	39	120	70	80	2.8	2.3
14	Cat	Geriatric	37	180	40	160	1.4	10.4
15	Dog	Adult	38.4	180	40	206	2.6	5

Source: Patients' initial observations.

patients, it cannot be confirmed that they were ever septic; however, they were diagnosed septic by their clinicians in charge and were treated as such.

After the VSCB, 41% (7/9) of patients were started on antibiotics within 3 hours of admission. The remaining two patients (22%) did not have antibiotics documented on their hospital records. These were also the two patients that did not survive out of the data collected after the VSCB. There are some reasons that these patients may never have received antibiotic therapy; it may be that as a referral centre, the patients coming to the service have already been seen by their primary veterinary surgeon. If the primary surgeon suspected sepsis or they recently underwent surgery, they may have received a dose of antibiotics already. Therefore, antibiotic dosing so soon after arriving at the QMHA may not have been required. Another reason may be that critical patients arriving at the QMHA may have required stabilisation prior to sample collection before starting antibiotics, or that antibiotics were

overlooked while more intensive medical interventions were ordered.

Due to data collection being retrospective, there are many limitations of the audit. Record keeping in hospitals is vital as treatment sheets are legal working documents. As such, every intervention must be recorded and signed by the team member involved with that intervention or treatment. All medications administered must be recorded, so it must be assumed that the documents are correct. As the data were retrospective, many of the patient files did not contain previous history. Some of these patients may have received treatment recommended by the sepsis care bundle prior to arriving at the QMHA, but this was not documented on their current hospital sheets.

The sample size for this data collection is small due to time limitations. Although the QMHA sees high numbers of septic cases throughout the year, the number of patients presenting with sepsis during data collection was comparatively low. It may be worth expanding this study in order to collect a

larger sample size to give a more accurate representation of the impact of a VSCB. If the study was to be conducted on a larger scale, a change I would make is to conduct training with all staff. As in the study by Bentley et al. (2016) mentioned above, running training sessions on sepsis recognition raised compliance by nearly half. I would also introduce a questionnaire for all staff involved at the beginning of the study (before training and bundle introduction) and at the end of the study. By doing this, I could identify areas of the protocol that need more training and support, and I could also see whether the results of the study correlate with improved knowledge of the team as a whole.

The bundle was introduced to the ICU as this is the main area where septic patients are managed. However, some patients may deteriorate while in wards, so this may be relevant there too, so I would like to introduce a flowchart to these areas highlighting the symptoms and signs of sepsis to show the progression of the syndrome. A short "Care Plan" may be useful to introduce along with the bundle itself.

This could be introduced to patient files on admission and have an easy tick-box design to encourage compliance.

The bundle introduced during this audit was based on the SSC Sepsis Six bundle. As human medicine is moving more towards the Sepsis Three and changing their diagnosis of “sepsis” to make it more specific, it may be good to develop a bundle that is more compact and easier to follow.

Conclusion

Research into sepsis in veterinary patients has been conducted for many years and is varied. It continues to be a widely discussed topic among veterinarians and nurses as everyone in a clinical role will treat septic patients at some point in their careers. Sepsis still has one of the highest mortality rates in human medicine and it is widely accepted that this is also the case for veterinary medicine.

Despite all the studies and research, the definition for sepsis is still a controversial topic and this appears to be the case in the human

field of research too. As human research is moving away from classifying sepsis as SIRS with infection, it is assumed that the veterinary research will also include reclassifying sepsis in time, in order to make a diagnosis clearer for clinicians and nurses alike.

Sepsis bundles have been used successfully in human hospitals for many years. Research into implementation of bundles has shown such protocols including training for staff improve sepsis mortalities significantly. As we strive to improve our care for veterinary patients, it seems that we should be following this trend and introducing our own bundles in order to start treating sepsis more effectively and uniformly to improve survival rates and decrease the rate that sepsis progresses to multiple organ dysfunction syndrome (MODS)/multiple organ failure (MOF). The bundle introduced here was fairly easy to use and provided suggestions on treatment for patients set out into a flowchart for usability. VNs are invaluable in recognising septic signs early in patients as they spend the most time with them in practice.

Specific training should be provided to VNs on a regular basis so they increase their knowledge and become more aware of the clinical symptoms. All of this combined would provide better treatment to patients and overall may reduce morbidity and mortality associated with sepsis and septic shock, while empowering VNs to fulfil their roles to the best of their ability.

References

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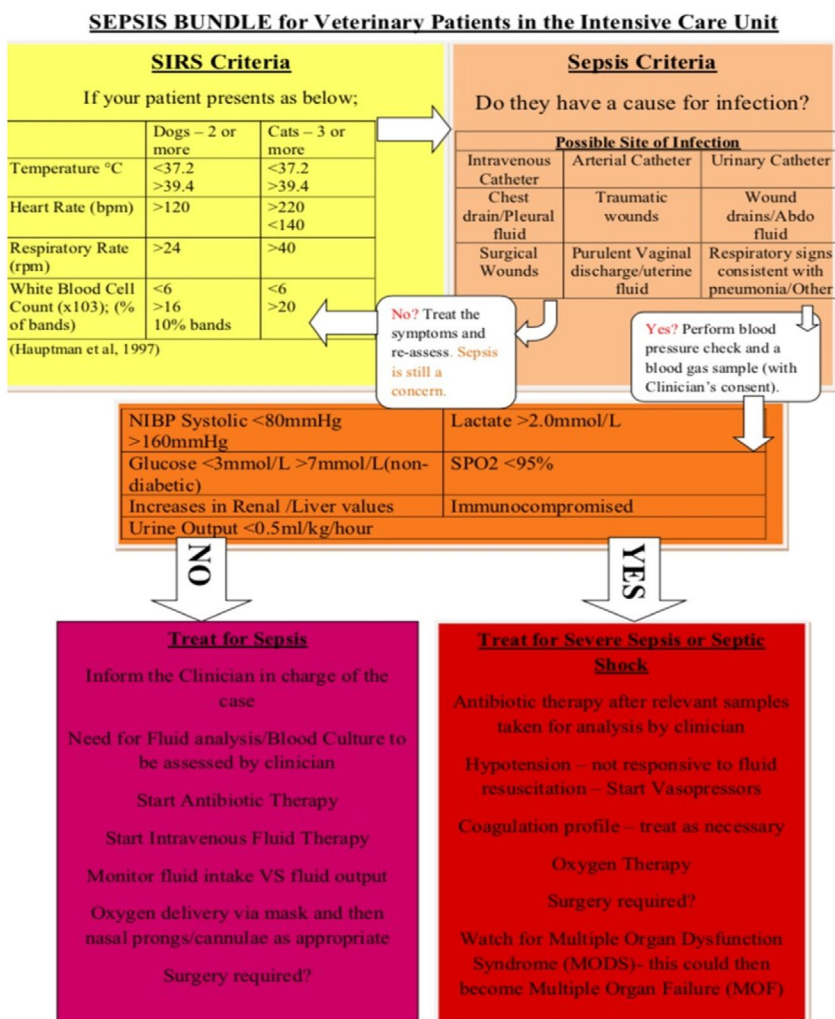
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Appendix

Veterinary Sepsis Care Bundle



Produced by Katherine Gray RVN November 12th 2016 Adapted from Surviving Sepsis Campaign Sepsis 6 Care Bundle.