

Posters

Thursday 21st of March

Agreement between invasive and oscillometric arterial blood pressure measurements using the LifeWindow multiparameter monitor and 2 different cuff sizes in anaesthetised adult horses

Evaluation of the pre-peritoneal continuous wound infusion with ropivacaine for postoperative pain control following ovariohysterectomy in bitches

Evaluation of midazolam, lidocaine and fentanyl for co-induction of anaesthesia with propofol in sheep

An investigation into the use of mechanical nociceptive threshold (MNT) testing in dogs undergoing routine orthopaedic surgery.

Ultrasound-guided rectus sheath catheter placement in horses: a preliminary feasibility study

Friday 22nd of March

Comparison of continuous positive airway pressure and traditional oxygen therapy for treatment of postoperative hypoxemia in dogs

Analgesia by pharmacopuncture with flunixin meglumine into the acupoint GV1 (Ho Hai) in horses undergoing elective orchiectomy

Determination of the pharmacokinetics of medetomidine in Sprague-Dawley rats for refinement to the use of medetomidine and isoflurane in rodent functional MRI studies.

Plasma concentration and physiological responses to single and incremental combined doses of dexmedetomidine, tiletamine, zolazepam and butorphanol in growing pigs

Perception of small animal cardiopulmonary resuscitation in owners presenting to a small animal teaching clinic including a large first opinion service

Agreement between invasive and oscillometric arterial blood pressure measurements using the LifeWindow multiparameter monitor and 2 different cuff sizes in anaesthetised adult horses

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Arterial blood pressure monitoring using oscillometry is an attractive alternative to a direct (IBP) technique, but monitors vary in performance. The study aim was to compare oscillometric and IBP techniques. In a prospective, randomised clinical study, 43 adult horses undergoing general anaesthesia in dorsal recumbency for different procedures were recruited. Anaesthetic protocols varied according to clinician preference. IBP measurement was achieved after cannulation of the facial artery and connection to an appropriately positioned transducer connected to a LifeWindow monitor. Monitor accuracy was checked daily using a mercury manometer. For each horse, non-invasive blood pressure (NIBP) was measured with two cuff widths (corresponding to 25% or 40% of mid-cannon bone circumference), connected to the same monitor and six paired IBP/NIBP readings were recorded (minimum 3 minutes between readings). NIBP values were corrected to the level of the xyphoid process. A Bland-Altman repeated measures analysis was used to assess bias (NIBP-IBP) and limits of agreement (LOA).

The 40% cuff width (SAP: bias 7.9 mmHg, LOA -26.6 - 42.3. MAP: bias 4.9 mmHg, LOA -28.2 - 38.0. DAP: bias 4.2 mmHg, LOA -31.4 - 39.8) performed better than the 25% cuff width (SAP: bias 26.4 mmHg, LOA -21.0 - 73.8. MAP: bias 15.7 mmHg, LOA -23.8 - 55.2. DAP: bias 10.9 mmHg, LOA -33.2 - 54.9).

In the monitor studied, the 40% cuff width provided better agreement with IBP, however both cuff sizes failed to meet ACVIM Consensus Statement Guidelines for the Identification, Evaluation, and Management of Systemic Hypertension in Dogs and Cats.

Evaluation of the pre-peritoneal continuous wound infusion with ropivacaine for postoperative pain control following ovariohysterectomy in bitches

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Lidocaine delivered via a wound catheter, offers effective analgesia after ovariohysterectomy in dogs (Morgaz et al., 2014). Ropivacaine has not been studied in dogs at all via wound catheter.

Twenty-two dogs were divided randomly into two groups: catheter group (CG), received ropivacaine for 24 hours ($1 \text{ mg kg}^{-1} + 0.8 \text{ mg kg}^{-1} \text{ h}^{-1}$) delivered via wound catheter placed in the pre-peritoneal space and the epidural group (EpG), received ropivacaine (1.3 mg kg^{-1}) and morphine (0.1 mg kg^{-1}) epidurally after induction with propofol. At baseline and at 1, 2, 4, 6, 18, 21 and 24 hours after extubation, HR, f_R , rectal temperature and degree of sedation, were evaluated. Pain was assessed with a dynamic and interactive visual analog scale (DIVAS), Glasgow composite scale (CMPS-SF) and mechanical wound thresholds (MT) cranial, medial and caudal to the wound. In EpG, motor block and respond to digital clamp in hindlimbs were evaluated. When $\text{CMPS-SF} \geq 6$, methadone ($0.2 \text{ mg kg}^{-1} \text{ IM}$) was administered. A Kruskal-Wallis test was carried out and when significant differences appeared, the Mann-Whitney U test was used.

At 6 hours, MT had a significantly higher values in CG (13.7 (10.1 - 16.7)) than in EpG (10.3 (2.2 - 14.8)). No other significant differences were found. Dogs in the EpG presented motor block for 1 - 4 hours. In EpG, one dog at 6 hours required rescue analgesia.

Ropivacaine delivered via a wound catheter is an alternative method to epidural anaesthesia after an ovariohysterectomy, without motor and sensitive block in hindlimbs.

Morgaz J, Muñoz-Rascón P, Serrano-Rodríguez JM et al. (2014) Effectiveness of pre-peritoneal continuous wound infusion with lidocaine for pain control following ovariohysterectomy in dogs. *Vet J* 202, 522-526.

Evaluation Of Midazolam, Lidocaine And Fentanyl For Co-Induction Of Anaesthesia With Propofol In Sheep

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Midazolam and fentanyl have been used as co-induction agents with propofol in dogs to reduce the propofol requirements during induction (Covey-Crump & Murison 2008; Minghella et al. 2016).

A prospective, randomized, blinded controlled study was performed in 60 sheep to evaluate the dose-sparing effect of midazolam (0.3 mg kg^{-1} , $n = 15$), lidocaine (1 mg kg^{-1} , $n = 15$) and fentanyl ($3 \text{ } \mu\text{g kg}^{-1}$, $n = 15$) on propofol requirements and cardiopulmonary parameters.

Twenty minutes after premedication with detomidine ($30 \text{ } \mu\text{g kg}^{-1}$) and morphine (0.2 mg kg^{-1}) IV, co-induction agent or saline (control group, $n = 15$) was injected over 60 seconds. Two minutes after, anaesthesia was induced with propofol to effect ($1 \text{ mg kg}^{-1} \text{ min}^{-1}$). Sheep were preoxygenated before and throughout the induction. Invasive arterial pressure, HR, *fr*, pH, PaCO₂ and PaO₂ were measured at baseline, 5 minutes after premedication and 2, 5 and 10 minutes after induction. Quality of sedation and induction were assessed. ANOVA and Bonferroni's test was used for comparisons between groups and Dunnett's test to compare baseline with each time point within group and propofol dose ($p < 0.05$).

Propofol requirement was significantly lower in midazolam and fentanyl groups (1.91 ± 0.84 and $2.59 \pm 0.58 \text{ mg kg}^{-1}$, respectively) compared with saline group (3.35 ± 1.02). Cardiopulmonary variables changed over time but were not significantly different between groups. Quality of sedation and induction were similar in all groups.

Midazolam and fentanyl, but not lidocaine, decreased propofol requirement. Cardiopulmonary parameters were not different between the groups.

Covey-Crump GL, Murison PJ (2008) Fentanyl or midazolam for co-induction of anaesthesia with propofol in dogs. *Vet Anaesth Analg.* 35(6):463-72.

Minghella E, Auckburally A, Pawson P et al. (2016) Clinical effects of midazolam or lidocaine co-induction with a propofol target-controlled infusion (TCI) in dogs. *Vet Anaesth Analg.* 43(5):472-81.

An investigation into the use of mechanical nociceptive threshold (MNT) testing in dogs undergoing routine orthopaedic surgery.

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MNT testing is validated to evaluate nociceptive thresholds in dogs (Sanchis-Mora et al. 2017, Harris et al. 2018) and could improve assessment of pain state alongside Dynamic Interactive Visual Analog (DIVAS) and Short-Form Glasgow Composite (SFGCPS) pain scales. This prospective pilot study measured MNTs in 36 dogs by a blinded operator prior to surgery (T0), 4 (T4) and 24 hours (T24) after surgery. Data were analyzed using Student's t test and Pearson correlation, considering $p < 0.05$ significant. Higher MNTs were measured at T4 in dogs that received an effective nerve block (PNB) ($n = 25$) compared to dogs that required rescue analgesia (fentanyl $1 \mu\text{g kg}^{-1}$) ($n = 11$) in response to nociception during surgery ($-0.56\text{N} \pm 3.74$ vs $-3.82\text{N} \pm 3.43$, $p = 0.019$) suggesting a preventive analgesic effect. Higher MNTs were measured at T24 in dogs treated with paracetamol plus NSAID (PANSOID) ($n = 15$) in contrast with dogs receiving only NSAID ($n = 21$) ($-2.20\text{N} \pm 1.57$ vs $-5.60\text{N} \pm 1.86$, $p < 0.001$), while success rate of PNBs was 73% vs 67% respectively. Significantly fewer doses of postoperative analgesia (methadone 0.2 mg kg^{-1}) were administered in the PANSOID group within the 24-hour observational period (1.07 vs 1.90). MNTs, SFGCPS and DIVAS results were accordant over time but correlation was poor with this sample size. MNT testing could detect differences in analgesic provision following orthopaedic surgery. PANSOID with successful PNBs provided superior analgesia and informs protocol selection for subsequent studies.

References

Harris, L. K., Whay, H. R., & Murrell, J. C. (2018). An investigation of mechanical nociceptive thresholds in dogs with hind limb joint pain compared to healthy control dogs. *The Veterinary Journal*, 234, 85-90.

Sanchis-Mora, S., Chang, Y., Abeyesinghe, S., Fisher, A., Volk, H. A., Pelligand, L. (2017). Development and initial validation of a sensory threshold examination protocol (STEP) for phenotyping canine pain syndromes. *Veterinary Anaesthesia and Analgesia* 2017, 44, 600-614.

Ultrasound-guided rectus sheath catheter placement in horses: a preliminary feasibility study

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Post-operative pain after midline celiotomy in horses is commonly treated with non-steroidal anti-inflammatory agents alone. In humans, reduced analgesic consumption post-operatively has been reported following rectus sheath block (Cho, 2018). This study was designed to investigate the feasibility of rectus sheath catheter placement in the equine abdominal wall.

Fresh Shetland pony cadavers (n = 7) were used. The ventral abdominal wall was clipped and visualized using a curved-array ultrasound probe (Philips Lumify C8-5) starting 5-10 cm from midline, midway between umbilicus and the xyphoid process of the sternum, looking for the area of maximum rectus muscle diameter. With the rectus sheath visualized, a 20G Tuohy needle (Perifix, BBraun) was introduced and a 10 mL povidone-iodine solution test injection made. Successful 'lifting' of the rectus muscle off the fascia was recorded, and (if seen) followed by catheter introduction with a further 30 mL injection via the catheter port. Visual confirmation of catheter advancement in the intended fascial plane was recorded. This procedure was performed bilaterally (14 insertions). The abdominal wall was dissected to reveal injectate and catheter placement.

Of fourteen attempts, twelve (86%) were ruled successful based on ultrasound imaging and confirmed by dissection. One insertion (7%) was a partial failure (injectate in rectus muscle, catheter in fascial plane) and one (7%) a full failure (injectate and catheter in intraperitoneal fat); both of these represented the first attempt by that anaesthetist and were correctly identified as failures by ultrasound.

These results require further confirmation prior to application in live horses.

1. Cho S, Kim YJ, Jeong K, et al. (2018) Ultrasound-guided bilateral rectus sheath block reduces early postoperative pain after laparoscopic gynecologic surgery: a randomized study. *J Anesth* 32, 189-197.

Comparison of continuous positive airway pressure and traditional oxygen therapy for treatment of postoperative hypoxemia in dogs

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Postoperative hypoxemia (PH) may occur up to 10 % of healthy dogs (Firulete et al. 2017). The aim of this study was to compare face mask O₂ supplementation or 5 cmH₂O continuous positive airway pressure at room air (CPAP_{air}) administered with a helmet, to treat PH.

Pulse oximetry at room air was monitored every 15 minutes for one hour after extubation (EXT) in dogs recovering from general anesthesia. Dogs that showed hypoxemia at EXT (SpO₂ < 95 %) were randomized to receive CPAP_{air} or O₂. Of the 34 dogs included in the study, 21 were hypoxemic of which 10 were treated with CPAP_{air} and 11 with O₂, the remaining 12 dogs were normoxemic, and served as the control group. Data were analyzed with ANOVA test (P < 0.05)

Mean ± SD values of SpO₂ recorded at room air at the different times of the study

Groups	Extubation	T0	T 15	T 30	T 45	T 60
Control	96.4 ± 1.7* #	97.1 ± 1.6*#	96.5 ± 1.2*	96.9 ± 1.6*	97.4 ± 1.5	97.1 ± 1.5
CPAP _{air}	89.6 ± 5.7	90.5 ± 2.8	95.7 ± 0.8 *	96.7 ± 0.9 *	97.1 ± 0.8	97.1 ± 1.1
O ₂	93.6 ± 3.9 #	91.9 ± 2.9	93.4 ± 1.9	93.1 ± 2.1	94.9 ± 0.8	95.1 ± 2.1

* P < 0.05 Vs O₂ group; # P < 0.05 Vs CPAP_{air} group

CPAP at room air is an effective treatment of PH in dogs ensuring a faster reestablishment of normoxemia, compared to face mask O₂.

References

Firulete C, Di Bella C, Skouropoulou D et al. (2017) Incidence and treatment of early transitory postoperative hypoxemia in dogs without cardiopulmonary pathologies: a pilot study. In: BSAVA Congress 2018, BSAVA (ed), Birmingham, UK. pp. 1.

ANALGESIA BY PHARMACOPUNCTURE WITH FLUNIXIN MEGLUMINE INTO THE ACUPOINT GV1 (*HO HAI*) IN HORSES UNDERGOING ELECTIVE ORCHIECTOMY

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The aim of the study was to evaluate the effect of a 1/10 dose of flunixin meglumine into the Governing Vessel 1 (GV1) acupoint in horses underwent elective orchiectomy.

Twenty animals were given detomidine (0.02 mg kg^{-1} , IV), followed by ketamine (2.2 mg kg^{-1} , IV) and diazepam (0.1 mg kg^{-1} , IV), and intratesticular anesthesia (30 mL of lidocaine) for the surgery. As postoperative analgesia, the animals were given 1.1 mg kg^{-1} of intravenous flunixin meglumine (FIV) or 0.11 mg kg^{-1} of flunixin meglumine into the GV1 acupoint (FGV). Pain assessment (Dalla Costa et al., 2014; Taffarel et al., 2015) was evaluated 12 hours before (baseline), and at 4, 6, 12, and 24 hours after the procedure; physiological parameters were measured at baseline and at 2, 4, 6, 8, 10, 12, 16, and 24 hours after the procedure.

The groups did not differ regarding pain assessment at any time. Heart rate was higher in the FIV group than in the FGV group at 2 hours (46 ± 5.2 vs. 37 ± 8.2 beats minute^{-1}). Gut sounds decreased at 2, 4, and 6 hours after surgery, in both groups. SAP was higher in the FGV group than in the FIV group at 8 hours (158 ± 18.1 vs. 134 ± 14.5 mmHg), 10 hours (157 ± 15.5 vs. 130 ± 11.5 mmHg), and 12 hours (151 ± 18.7 vs. 134 ± 15.8 mmHg).

Pharmacopuncture was equally effective as the conventional flunixin meglumine dose and route at pain control in horses underwent elective orchiectomy.

Dalla Costa E, Minero M, Lebelt D et al. (2014) Development of the Horse Grimace Scale (HGS) as a pain assessment tool in horses undergoing routine castration. PLoS One 9, e92281.

Taffarel MO, Luna SPL, Oliveira FA et al. (2015) Refinement and partial validation of the UNESP-Botucatu multidimensional composite pain scale for assessing postoperative pain in horses. BMC Vet Res 11, 1-12.

Determination of the pharmacokinetics of medetomidine in Sprague-Dawley rats for refinement to the use of medetomidine and isoflurane in rodent functional MRI studies.

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The combination of medetomidine and isoflurane is commonly used for anaesthesia of rodents undergoing functional magnetic resonance imaging (fMRI) because this combination of drugs appears to produce strong and reproducible resting-state and evoked blood oxygenation level dependent fMRI signals (Paasonen et al (2018)). The aim of this project was to 1) determine a target plasma concentration of medetomidine during low dose isoflurane anaesthesia of rats in an established protocol and 2) describe the pharmacokinetic profile of medetomidine administered subcutaneously in rats. Twenty-four male Sprague Dawley rats (333 ± 19 g) were randomly allocated to three equal groups: target plasma concentration identification (established protocol: isoflurane with medetomidine bolus 0.05 mg kg^{-1} SC then $0.15 \text{ mg kg}^{-1} \text{ h}^{-1}$ SC); SC = 0.05 mg kg^{-1} medetomidine SC; IV = 0.05 mg kg^{-1} medetomidine IV. The rats were anaesthetised with isoflurane and serial blood samples were collected prior to euthanasia up to 4 hours after the administration of medetomidine. Heart rate, expired CO_2 , temperature and blood glucose concentrations were measured during anaesthesia. Serum samples were analysed using a liquid chromatography-tandem mass spectroscopy (LC-MS/MS) technique. Anaesthesia was uneventful in all rats aside from temporary apnoea after the administration of the bolus doses of medetomidine. The blood glucose concentration was $>10 \text{ mmol L}^{-1}$ during the study. The target plasma medetomidine concentration was $14.4 \pm 3.0 \text{ ng/mL}$. Pharmacokinetic calculations will inform the ideal bolus and infusion regime for medetomidine with isoflurane for anaesthesia of rats for fMRI studies.

Paasonen J, Stenroos P, Salo RA, Kiviniemi V, Grohn O. (2018) Functional connectivity under six anesthesia protocols and the awake condition in rat brain. *NeuroImage* 172:9-20.

The project was approved by the Animal Ethics Committee of the University of Western Australia (RA/3/100/1599).

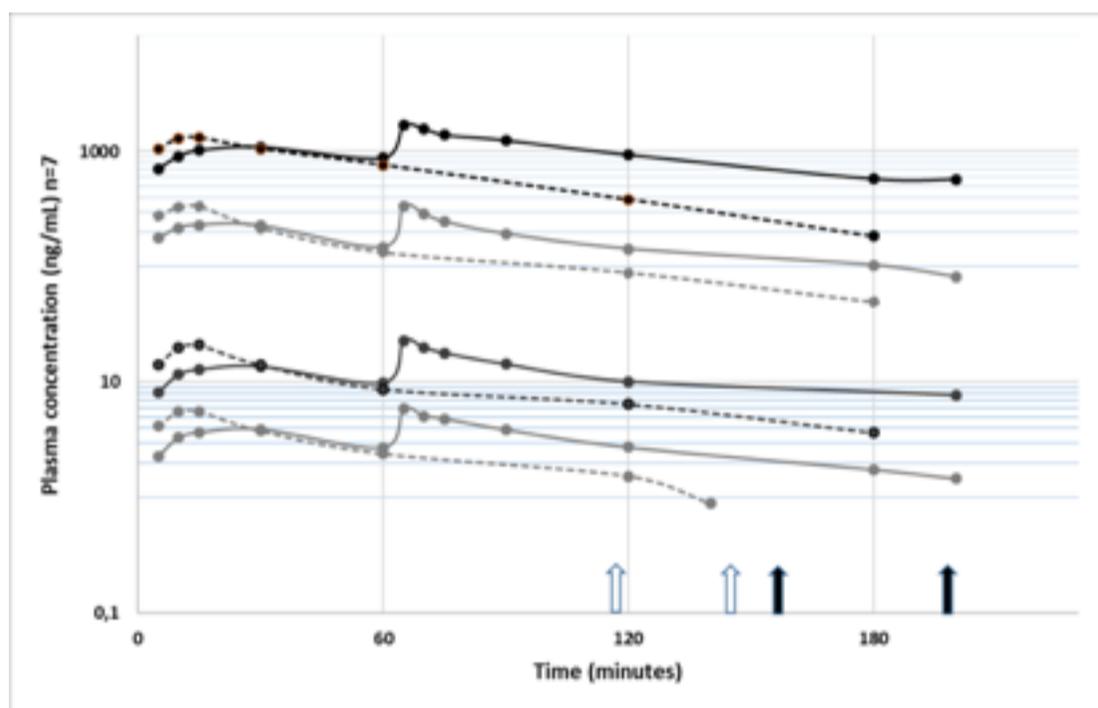
Physiological responses in relation to plasma concentration after one or two bolus doses of dexmedetomidine, tiletamine, zolazepam and butorphanol in growing pigs

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The pig is used as research animal. The aim was to evaluate physiological responses in relation to drug plasma concentrations after one or two bolus doses of anaesthetics.

Twelve pigs, 27–41 kg were randomised to one (1) or two bolus doses (2). In all pigs, anaesthesia were induced with dexmedetomidine 0.025 mg kg⁻¹, zolazepam/tiletamine 5 mg kg⁻¹, butorphanol 0.1 mg kg⁻¹ intramuscularly. After 60 minutes group 2 was given dexmedetomidine 0.008 mg kg⁻¹, zolazepam/tiletamine 1.66 mg kg⁻¹, butorphanol 0.03 mg kg⁻¹ intravenously. Blood samples were collected repeatedly from a MPC coated indwelling catheter, placed in the jugular vein (Ryden et al., 2018). Drug plasma concentrations were determined with mass spectrometry. Time to recumbency, first movements and standing position were recorded. Heart rate (HR), respiratory frequency (f_R), palpebral reflexes and response to noxious stimulus were monitored at set times points. Data was analysed by ANOVA, presented as mean \pm SD, $p < 0.05$ was considered significant.

Time to recumbency was 3.2 ± 0.8 minutes. HR and f_R did not change during anaesthesia. Palpebral reflex was absent in all pigs ten minutes after induction but the withdrawal reflex was present in some pigs after the initial injection.



Mean drug plasma concentration vs time points is shown as lin-log plot. Unfilled (single dose) and filled (two doses) arrows indicate time to first movement and standing, respectively.

The single intramuscular dose of the combination produced two hours of uneventful anaesthesia whereas the additional intravenous dosing prolonged the anaesthesia one hour.

RYDEN, A., MANELL, E., BIGLARNIA, A., HEDENQVIST, P., STRANDBERG, G., LEY, C., HANSSON, K., NYMAN, G. & JENSEN-WAERN, M. 2018. Systematic training enables stress free clinical examinations and samplings after kidney transplantation in pigs. In press.

Perception of small animal cardiopulmonary resuscitation in owners presenting to a small animal teaching clinic including a large first opinion service

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The purpose of this study was to gather information from veterinary clients to better understand and gauge the knowledge level and perception of small animal cardiopulmonary resuscitation (CPR) in an academic veterinary hospital.

An anonymous survey was developed and randomly distributed to a convenience sample of clients at a veterinary teaching hospital including a large first opinion service between October 2017 and March 2018. Of the 451 surveys distributed, 296 were used for the statistical analysis.

The majority of respondents (92%) knew the appropriate definition of CPR but only 11% knew how to perform CPR on a dog or cat. Most respondents (82%) wanted to discuss if their pet should or should not be resuscitated in the event of cardiac arrest. The mean estimate of rate of discharge provided by clients was $39.4\% \pm 25.6$ and the majority of respondents (202 [68%]) got their estimate from an educated guess. The respondents who would choose CPR provided an estimated cost of $\text{US}\$257 \pm 365$ while the respondents who would not choose CPR provided an estimated cost of $\$491 \pm 875$ ($p = 0.019$). The respondents that watched television medical dramas estimated a higher rate of survival to discharge at $42\% \pm 25$, while people who did not watch television medical dramas provided an estimated survival rate of $35\% \pm 26$ ($p = 0.034$).

Inaccurate perceptions regarding cardiopulmonary resuscitation and survival rates exist amongst the general public. However, respondents are interested in becoming better informed.