Ovine Lambings and Caesarean Sections: Clinical Audit

RCVS Knowledge Quality Improvement Award Champion 2023

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At the time of the Clinical Audit, David Charles was employed at Scarsdale Vets, part of IVC Evidensia Farm Vets.

Introduction

Assisted vaginal deliveries (lambings) and ovine caesarean sections comprise a high percentage of the sheep work large (and mixed) animal practitioners see during the Spring. Unlike in cattle, there is little recently published literature or guidance for performing these procedures in sheep.

Penicillin and streptomycin (Pen&Strep®, Norbrook Laboratories), a category C antibiotic, is commonly selected due to ease of use and low cost. With consideration to the new European Medicines Agency (EMA) categorisation of antibiotics for use in livestock, I wanted to assess whether the impact of using amoxicillin or penicillin only products (Category Ds) had any negative impact on clinical outcomes for lamb survival at 1-and 7- days post procedure to make evidence-based veterinary medicine (EBVM) recommendations, start to change attitudes and produce up to date practice group-wide standard operating procedures (SOPs).

There are currently no licensed non-steroidal anti-inflammatories (NSAIDs) for sheep in the UK but the use of NSAIDs remains recommended for surgical procedures in ruminants. Anecdotally many practitioners use the cattle doses off-license but in other countries, NSAIDs are licensed for sheep and consideration was given to assess the benefit of using the licensed sheep doses in recognised countries (Australia, New Zealand, Canada) to improve both ewe and lamb related outcomes.

There are also no licensed local anaesthetics, and therefore, no guidance on volumes. The audit wanted to assess what volumes practitioners were administering and where altering techniques or approaches could safely reduce the volume used to minimise the risk of toxicity or side effects, whilst ensuring appropriate loco-regional anaesthesia for surgery.

Aims of the clinical audit

There were several aims of this clinical audit, which included:

a) Assessing what our group was doing in terms of antibiotic use and produce recommendations.

b) Assess any differences in outcomes for using Category D 'prudence' products against Category C 'caution' products for these procedures.

c) Consider if adopting the licensed sheep doses of NSAIDs in other countries would improve outcomes or patient welfare.

d) Assess where changes could be made to safely reduce the volume and risk of toxicity and side effects with the use of local anaesthetics whilst maintaining animal welfare.

e) Assess if other actions (not including the procedure) could be influenced to improve clinical outcome (lamb survival) at 1 and 7 days, including procedure location, time of day, or assessment of colostrum on ewe.

f) Gather and assess the evidence behind my belief that we should implement the use of sterile surgical gloves in farm animal practice (something where I believed we were behind our small animal and equine colleagues and the human sector).

g) To challenge the perception that clinical audits and Quality Improvement (QI) are poorly suited to ambulatory production animal practice. This audit, review, and guidance documentation production aimed to prove the ease and effectiveness of performing clinical audits and other QI measures in ambulatory farm practice.

Actions

When designing the audit, I utilised the RCVS Knowledge Clinical Audit Checklist to reaffirm the topic selected. The RCVS Knowledge clinical audit cycle walkthrough was also useful (with the caveat that due to the seasonality of the work the timeline for points 6-7 as outlined further in this case example would be slightly different as repeating in 2 months would be outside of the breeding season and no clients would be lambing).

The design of the audit focused on collecting core 'patient' and 'procedure' data based on information about a number of key steps described in the literature about approaches to ovine-assisted vaginal delivery and ovine caesarean section. Outcomes data was also collected at day

1 and day 7 post-procedure to allow a direct outcomes comparison to the only other similar study [1].

I was also keen that the outcomes and ultimate report and guidance would be useful for vets in practice or 'on the ground', providing clear tangible evidence-based actions that could be implemented for QI with slightly less focus on the data analysis and statistical processes.

As a practice, Scarsdale recorded 60 lambings or sheep caesareans in the 2020/21 lambing season, so I approached IVC about conducting an IVC Evidensia (UK and Ireland) wide outcomes-based audit to increase the data collected and therefore the reliability and evidence base behind any guidance and recommendations made. The audit was specifically designed as an outcomes audit with measurable outcomes and a defined number of questions allowing for repeatability and data comparison. I championed the audit within the group and was able to gain the operational support of David Stockton (Group Veterinary Advisor [Large Animal] – now retired) to increase the traction and exposure of the audit amongst clinical directors within the group.

To gather more data in a year I also discussed the topic with the IVC Sheep Clinical Working Group (SCWG) to get some buy-in from within the IVC Evidensia (UK and Ireland) Farm team and recruit some local champions to promote the audit further within the group and help encourage completion.

To engage colleagues across all practices we also promoted it at the IVC Evidensia Spring Farm Conference in February before the main bulk of the lambing season and led a feedback session to understand the barriers or concerns people had with completing the audit to maximise completion rates. Based on this feedback, the end time of the audit was extended from 30/4/2022 to 31/5/22 as many Scottish practices advised us that they lamb through to the end of May, and it would increase the amount of data collected.

To support participation, I made myself readily available to colleagues in the group, and the SCWG as the main point of contact as the author/organiser of the audit to assist with participation. On a local level, I took charge of booking reminders onto the visit list on the appropriate days for the 1- and 7-day post-procedure calls. We also advised individual practices that they would receive practice level copies of the data and reports for their own internal analysis of practice performance vs group performance and recommendations.

To increase accessibility, I circulated information and links to the audit via email, the IVC intranet, and created a Bitly™ link, and a QR code that could be stuck up on practice

noticeboards or printed, laminated (to enable disinfection between farms) and kept in the ambulatory practitioner's car.

To ensure maximum uptake and reinforce the idea it was about QI and EBVM rather than about the work of individuals, we made the submission anonymous, just collecting region and practice codes rather than practitioners' names.

Results

Data was collected from 209 cases across 21 practices within the IVC Evidensia Group (Charles, 2022[2]).

The 7-day survival rates were favourable (86.2% of all ewes lambed and 94.8% of all ewes undergoing Caesarean Section were alive, bright, alert, and responsive 7-days post-procedure) and identified key areas where improvement recommendations would lead to improved lamb and ewe survival rates to 7 days as well as reduced surgical complications.

These areas were:

Antibiotics:

- A wide range of selected drugs and duration was recorded under antibiotic use.
- No negative outcomes or complications were reported using category C 'caution' over the previously preferred category D 'prudence' products.

Antibiotic Product	Antibiotic	%	EMA Category
Betamox 150	Amoxicillin	5.6	D
Betamox LA	Amoxicillin	4.7	D
Depocillin	Procaine Benzylpenicillin	0.9	D
Hymatil	Tilmicosin	12.1	C
Pen&Strep	Procaine Penicillin & Dihydrostreptomycin Sulfate	63.6	D & C
Pen&Strep and Hymatil	Procaine Penicillin & Dihydropstreptomycin & Tilmicosin	3.7	D & C & C
Synulox	Amoxicillin-Clavulanate	0.9	C
Trymox	Amoxicillin	5.6	D
Zactran	Gamithromycin	0.9	C
None	-	1.9	-

Figure 1: Antibiotic selection for caesarean section

Anaesthesia and Analgesia:

- Utilising line block vs inverted-L resulted in an average reduction of procaine hydrochloride by 10.1ml. This allows an effective block to be performed without encroaching on the 6-10mg/kg toxic dose reported in the literature, in turn improving patient safety.

- Under 30% of respondents used a sacrococcygeal epidural and discussions with colleagues often identified a lack of experience or confidence in the technique in sheep as a key barrier to its use. By providing a clear 'how-to' guide we have increased practitioners' confidence with this technique for improved outcomes and ewe analgesia.

- With the toxic dose equating to a maximum dose of 18.75ml/70kg ewe we identified significant overuse within the group, often owing to the fact no published doses or datasheet doses for sheep are provided by manufacturers. We were able to extrapolate down and provide evidence-based examples of how to dilute with sterile water to allow anaesthesia of a larger area.

- This subsequent advice on safe doses has been used by respondents in the group successfully.

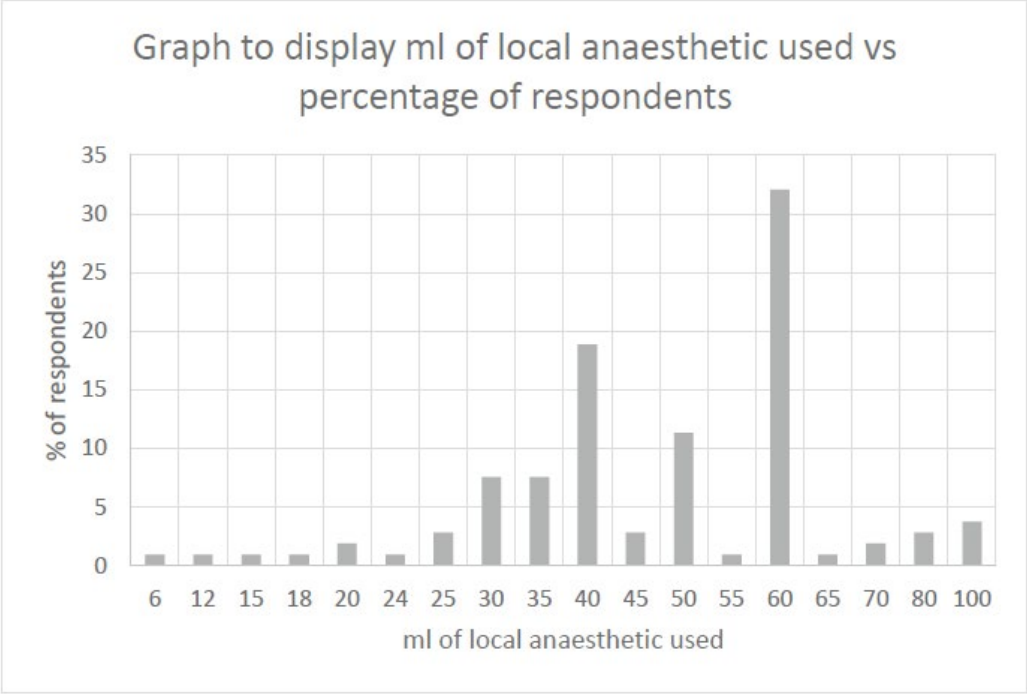

Figure 2: Graph showing the commonly used volumes of local anaesthetic vs percentage of respondents.

- Oxytocin use was found to increase ewe caesarean survival rate by 14% and reduce incidences of retained foetal membranes (RFM) by 13%. The recommendation to incorporate oxytocin use into caesarean standard operating procedures (SOPs) is expected to have a notable positive impact on post-procedure complications.

The full published audit is available at[2]: Charles, D. and Stockton, D. (2022) Ovine Caesarean sections and assisted vaginal deliveries: a clinical audit. *Livestock*, 27 (6), pp. 282-287. https://doi.org/10.12968/live.2022.27.6.282

Impact of intervention

Once all the data had been collated and analysed, a series of recommendations and resources were compiled into laminated documents, SOPs, and how-to guides and circulated at the IVC Evidensia Farm conference, and online via the group intranet. The impact following the adoption of these recommendations has been far-reaching:

Antibiotics:

- A level of resistance was faced when presenting the recommendation to use Category D antibiotics (amoxicillin) before reaching for Category C's (penicillin and streptomycin) with many practitioners claiming it was a historic product choice, and they were too used to it, or farmers would just be ringing up to order.

- Overcoming this involved discussion around proactive engagement with clients through flock health plans to come up with SOPs and first-line products for the farmers to have over lambing time, and challenging vets' perceptions and reasons for historically using penicillin and streptomycin.

- Often this historic choice was due to cost, so worked cost examples for a 3-day course were given for amoxicillin vs penicillin and streptomycin to show the minimal price difference.

- A Farm Vet Champions (FVC) SMART Goal has been set for the IVC SCWG and their associated practices/teams to commit to reducing the use of Category C antibiotics in ovine obstetrical cases. The aim is to reduce client use by starting conversations now ahead of the next lambing season to 'Plan, Prevent, and Protect' our flocks.

- By using the FVC goals and the IVC SCWG as champions of this we have been able to highlight the fact no difference in clinical outcomes has been seen and challenge

practitioners to meet the FVC goal next season using more Category D and less Category C antibiotics.

A follow-up audit was devised and conducted from December 2022 - May 2023 to assess the impact of the recommendations and how practitioners' decision-making had changed, or been influenced, by the 2021/22 audit. The group saw increased engagement (416 responses), and encouragingly 53.6 % of respondents used a Category D antibiotic for caesarean section (of which 46.5 % chose amoxicillin). Almost 25 % of respondents changed their antibiotic product based on the 2021/22 audit and publications[3].

Analgesia and Anaesthesia:

- A notable area for improved outcomes was detected around the lack of use of denaverine hydrochloride for incomplete cervical dilation (ICD/ringwomb) cases. 18% of the total cases requiring caesareans in this audit were due to ICD/ringwomb but very few respondents had tried denaverine hydrochloride.

- Only 20% of those patients presenting with ringwomb received denaverine hydrochloride to dilate the cervix. 94% of those few (<5% of practitioners) that did administer it were able to correct the ICD/ringwomb and deliver naturally avoiding a caesarean section.

- Uptake of the recommendation to utilise denaverine hydrochloride across the group could lead to a reduced surgical conversion rate for ICD/ringwomb cases, benefitting sheep welfare.

- Since producing the standard dosages and recommended medicines for ovine obstetrics documents we have engaged with KRKA, manufacturer of Sensiblex® – the denaverine hydrochloride product for dilating incomplete cervical dilation (ICD/ringwomb) and providing analgesia to soft tissues of the birth canal. Working with the IVC Evidensia procurement team to raise awareness of the product, the aim is to decrease the number of caesarean sections due to the inability to correct and increase analgesia in those that are corrected to improve ewe welfare.

- By highlighting within the group the off-license drugs being used, and the recommended course/dose guidelines produced as a result, we are ensuring that appropriate compliance with minimal residue limit (MRL) legislation and that off-licence prescription recording is being completed, with appropriate conversations with clients if products are vet administered.

- It was also impressive to see 100% of ovine caesarean section cases received NSAIDs across the group.

Infection Control: assessing glove use and surgeon/patient prep methods.

- The IVC Evidensia SCWG has worked on highlighting the benefits of an alcohol-based hand rub for on-farm surgical surgeon preparation. To reduce the risk of environmental contamination from on-farm buckets as well as highlight the benefits of alcohol-based hand rubs, further work is ongoing to change perceptions and increase the uptake of surgical gloving. Only 25% of surgeons wore surgical gloves during this audit for ovine caesarean section, in contrast to 87% of respondents wearing gloves for a lambing. The audit found those who didn't glove were 10% more likely to report skin irritation within 24 hours of the procedure. Barriers again involved 'historical' practices for surgical preparation. This was countered by demonstrating the benefits of the use of surgical gloves, alongside highlighting how small animal and human surgeons are debating the use of 1 or 2 pairs rather than the use of gloves at all!

We have also found practices within the group who have adopted these recommendations have used team meetings and 'clinical clubs' to discuss their practice-level approaches and where improvements or changes can be made based on the audit publication. A notable improvement is many practitioners reducing their local anaesthetic use whilst maintaining appropriate loco-regional anaesthesia for caesarean sections.

A re-audit was carried out in the 2022/23 lambing season, with one notable addition. Respondents were asked an additional question to understand how the new evidence-based recommendations from the 2021/22 audit and subsequent publications had changed their decision-making in cases of assisted vaginal delivery or ovine caesarean section. Respondents could pick one area that had been affected or select that there was 'an overall impact' if more than one thing changed as a result. There was a notable positive change in behaviour when selecting appropriate antimicrobials, with 39% of respondents stating that the recommendations from the 2021/22 report had 'an overall impact' on their decision-making in an assisted vaginal delivery or caesarean section.

The audit results were presented at the Sheep Veterinary Society Conference in September 2023, with further publication in the veterinary press, showcasing how clinical audit can influence farmers and vets to the benefit of sheep health and welfare[3,4].

We now have a precedent about implementing clinical audits within the group and discussion is being had about support for colleagues at other practices in developing a bovine displaced

abomasum audit, being able to reflect on the challenges and barriers we faced to participation and analysis.

Continued on next page.

Summary

Clinical audit is a process for monitoring standards of clinical care to see if it is being carried out in the best way possible, known as best practice.

A clinical audit can be described as a systematic cycle. It involves measuring care against specific criteria, taking action to improve it, if necessary, and monitoring the process to sustain improvement. As the process continues, an even higher level of quality is achieved.

What the clinical audit process is used for

A clinical audit is a measurement process, a starting point for implementing change. It is not a one-off task, but one that is repeated regularly to ensure ongoing engagement and a high standard of care.

It is used:

- ⇒ To check that clinical care meets defined quality standards.
- ⇒ To monitor the changes made to ensure that they are bringing about improvements and to address any shortfalls.

A clinical audit ensures concordance with specific clinical standards and best practices, driving improvements in clinical care. It is the core activity in the implementation of quality improvement.

A clinical audit may be needed because other processes point to areas of concern that require more detailed investigation.

A clinical audit facilitates a detailed collection of data for a robust and repeatable recollection of data at a later stage. This is indicated on the diagram wherein in the 2nd process we can see steps 4, 5 and 6 repeated. The next page will take you through the steps the practice took to put this into practice.

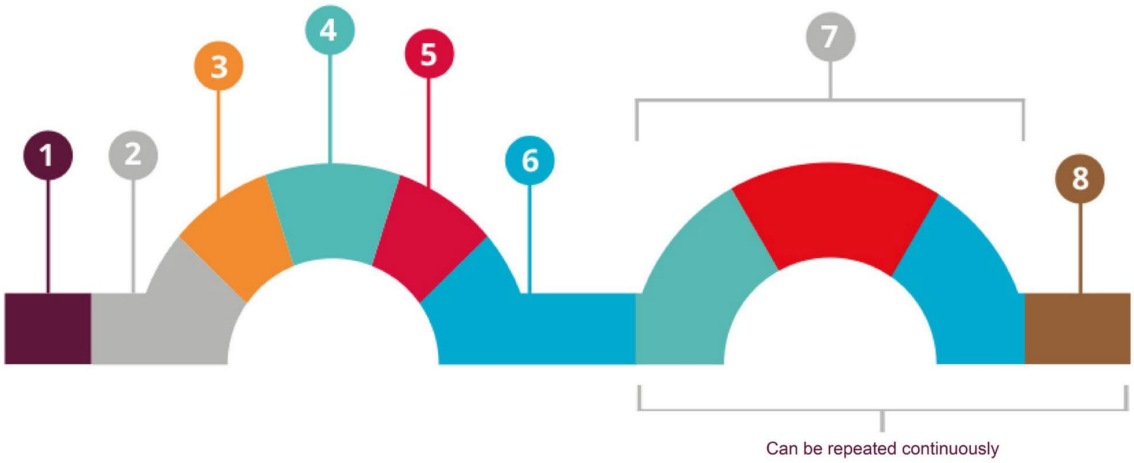

Figure 1: The Veterinary Clinical Audit Cycle by RCVS Knowledge. Available from www.rcvsknowledge.org. Developed by the Royal College of General Practitioners www.rcgp.org.uk/qi-ready

1. Choose a topic relevant to your practice

The topic should be amenable to measurement, commonly encountered and with room for improvement. Assess the factors associated with ovine lambings that may influence ewe and lamb outcomes, including reducing the use of Category C 'caution' antibiotics, improving the use of analgesia and anaesthesia, and infection control and biosecurity measures.

2. Selection of criteria

Criteria should be easily understood and measured. All ewes lambing during the lambing season across the IVC Evidensia (UK and Ireland) Group were eligible to be included in the audit. Data was collected from 209 cases across 21 practices.

3. Set a target

Targets should be set using available evidence and agreeing best practices. The first audit will often be an information-gathering exercise, however, targets should be discussed and set. There was no pre-audit data available. The target was to assess what the group was currently doing in terms of antibiotic use, provision of anaesthesia and analgesia, and infection control measures to produce evidence-based group-wide

recommendations and standard operating procedures for ewes undergoing lambings and caesarean sections.

4. Collect data

Identify who needs to collect what data, in what form and how. Anonymous data was collected by veterinary surgeons. Submission to the audit was encouraged by audit champions and circulated information with links to the audit questions to standardise the information gathered.

5. Analyse

Was the standard met? Compare the data with the agreed target and/or benchmarked data if it is available. Note any reasons why targets were not met. These may be varying reasons and can take the discussion from the entire team to identify. No negative outcomes or complications were reported using category C 'caution' over category D 'prudence' products. It was found the utilising line block vs inverted-L used on average 10.1ml less of procaine hydrochloride, and therefore, will allow an effective block to be performed without encroaching on the 6-10mg/kg toxic dose reported in the literature improving patient safety. Oxytocin use was found to increase ewe caesarean survival rate by 14% and reduce incidences of retained foetal membranes (RFM) by 13%. 100% of ovine caesarean section cases received NSAIDs across the group.

6. Implement change

What change or intervention will assist in the target being met? Develop an action plan: what has to be done, how and when? Set a time to re-audit. New group-wide recommendations and standard operating procedures (SOPs) were produced[2], including setting a Farm Vet Champions (FVC) SMART Goal for the IVC SCWG and their associated practices/teams to commit to reducing the use of Category C antibiotics in ovine obstetrical cases and improve vet-farmer communication about the use of antibiotics ahead of the next lambing season.

7. Re-audit

Repeat steps 4 and 5 to see if changes in step 6 made a difference. If no beneficial change has been observed them implement a new change and

repeat the cycle. This cycle can be repeated continuously if needed. Even if the target is not met, the result can be compared with the previous results to see if there is an improvement. A re-audit was carried out in the 2022/23 lambing season, with one notable addition. Respondents were asked an additional question to understand how the new evidence-based recommendations from the 2021/22 audit and subsequent publications had changed their decision-making in cases of assisted vaginal delivery or ovine caesarean section. Respondents could pick one area which had been affected or select that there was 'an overall impact' if more than one thing changed as a result. These results were published in veterinary press[3,4].

8. Review and reflect

Share your findings and compare your data with other relevant results. This can help to improve compliance. Following the publication of the audit results and data[2], practices within the group have adopted these recommendations and have used team meetings and 'clinical clubs' to discuss their practice-level approaches and where improvements or changes can be made. There is now a precedent about implementing clinical audits within the group and discussion is being had about support for colleagues in developing further audits.

References

[1] Voigt, K. et al. (2020) Factors associated with ewe and lamb survival, and subsequent reproductive performance of sheep undergoing emergency caesarean section. *Reproduction of Domestic Animals*, 56 (1), pp, 120-129. https://doi.org/10.1111/rda.13855

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[3] Charles, D. (2023) Ovine obstetrics: Clinical audit findings & EBVM recommendations [Short Presentation]. In: *Sheep Veterinary Society Autumn Conference. Golden Jubilee Conference Hotel, Glasgow 25-27 September*.

[4] Charles, D. (2023) Can Clinical Audit influence the actions of Farmers and Vets to benefit Sheep Health and Welfare? *Animal Science Cases*. https://www.cabidigitallibrary.org/doi/10.1079/animalsciencecases.2023.0004

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