Criteria for depth of knowledge and skills needed:

- **Causal knowledge** - sufficient to be able to teach the components and steps explaining the event in an understandable fashion
- **Problem** - Not recognizing causal knowledge gaps and fuzzy vocabulary that result in “Illusion of explanatory depth.” To detect, to detect, write down each step of a causal explanation of how something works, writing ‘gap’ for steps that you don’t know
- **Skills** - Sufficient to be able to perform the skill while talking to a client
- **Problems** - stopping practice before automaticity is required, not performing deliberate practice, and not revisiting skills with sufficient frequency to prevent loss from disuse

Know canine & feline preventive medicine protocols and conditions associated with livestock operations

Compared to dogs and cats in city environments, those on livestock operations have greater exposure to other species, feral members of their own species, specific infectious diseases, and other hazards more frequent around livestock operations. The families associated with livestock operations usually have domestic pets that often range in the livestock environment. Working dogs may have important roles in animal handling. Dogs often serve a security function and cats are often seen as controlling vermin. Being knowledgeable in their care can be an important component of your credibility, particularly if the animal owner doesn’t have a relationship with a small animal practitioner.

- **Know vaccination protocols**: Because of the wild species and unvaccinated feral dog and cat populations in rural areas, free roaming domesticated animals on farms are more likely to be exposed to infectious agents such as rabies and canine distemper than their city brethren. They should be vaccinated following current vaccination protocols.
  - AAHA canine vaccination guidelines
  - NASPHV rabies compendium pdf
- **Know internal parasite control protocols**: Because of the opportunity to function as more natural carnivores with less controlled diets than their city brethren, they are more likely to be infected with parasites having a predator-prey cycle, such as toxoplasma, Taenia pisiformis, and Taenia taeniaeformis, and the evidence of some infections is clear.
- **Know diagnosis and handling of those conditions of greater risk in farm and ranch pets**: Examples are exposure to rabid animals, ethylene glycol toxicity, porcupine quills, rattlesnake envenomation, pesticide toxicities, and cheatgrass awns
- **Know zoonotic conditions of special risk between humans and pets in the farm environment and associated precautions**: Examples are echinococcosis, salmonellosis, toxoplasmosis, rabies, and Bubonic plague. Know who is at special risk, how to proceed, identify who to contact, and how to contact them before a potential case occurs.
- **Know how to control those agents potentially transmitted between domestic pets and livestock**: Examples are salmonella, Neospora caninum, toxoplasama, echinococcosis, anthrax.
- **Hone physical exam skills** (e.g., auscultation, palpation, ballottement, percussion, special techniques)

Know Common Small Animal Conditions Cold

Have “step out of the truck” knowledge and skills for diagnosing, treating, and preventing, say, the top ten conditions experienced by dogs and cats in your region.
“The top 10 diagnoses in dogs and cats” by age (Aug 1, 2010 Veterinary Economics)

Hone Physical Exam Skills and Techniques

Because rural mixed practices usually cannot justify advanced imaging and laboratory equipment investments, excellent physical exam skills and techniques are critical for making initial diagnoses and determining the next case management steps. Obtain a good clinical exam book, such as Radostits’s Veterinary Clinical Examination and Diagnosis or Rijnberk and Sluijs’s Medical History and Physical Examination in Companion Animals, 2nd ed. or other guide, such as Vet Clinics of NA Food Animal 8(2), 1992, and practice your physical exam skills and techniques at every opportunity. Look for cases manifesting physical exam abnormalities and request permission to examine the animal.

A list of entry-level skills and competencies expected by a large corporate practice is here

HSVMA Rural Area Veterinary Services provides an on-line form pdf for Physical Examination of Dogs and Cats

Develop Specific Mixed Practice Surgical Skills

A problem in mixed practice with a heavy ag animal caseload is returning from a long day of on-farm calls to find several spays and neuters that are promised to go home tomorrow afternoon and that they are yours to do. Spays and neuters are one of most common small animal procedures in mixed practice. Most new graduates will know what to do and how to do it properly; the big problem is doing that rapidly and efficiently, which takes practice. If new graduate gains that practice before graduation, they are worth more to an employer because they can immediately step in to doing those in an efficient fashion without supervision. No more three hour spays or two hour tomcat neuters. Because of the large case load in a busy, multi-person small animal practice, new graduates entering such a practice can be brought up to speed rapidly. Because of the lower sporadic small animal caseload in a typical rural mixed practice, accumulating sufficient case experience, say 100 spays, to achieve speedy competence requires a much more time, often in the form of many long evenings doing them.

Selected new graduate performance goals (from SA Skills Inventory pdf above - note “yes” column are “core skills”):

- Collect a blood sample on the first or second try over 75% of the time from the cephalic, saphenous, or jugular veins with minimal restraint in the average patient
- Obtain a general interpretation of dog or cat health from the blood smear within 10 minutes
- Perform uncomplicated canine surgical castration in < 30 minutes with positive outcome > 95% of the time
- Perform uncomplicated canine ovariohysterectomy in < 45 minutes in < 85 lb dogs and < 1 hr in > 85 lb dogs with a positive outcome > 95% of the time
- Perform canine C-section in < 1 hour with positive outcome > 90% of the time

As established by Ericsson (2004), developing entry level competency requires at least 40 hours of deliberate practice. And practicing 15 minutes per day is much better than an hour and a half once a week or heaven forbid, six solid hours of practice just before heading off to that preceptorship. When you are on clinic blocks, you will often be far too busy and too tired to get much practicing in. How can the new graduate have acquired the equivalent of one week of experience practicing those skills before
graduation or, perhaps more importantly, their visit to the practice with the job opening? The key is to develop and hone your manipulative skills well before your fourth year and then during your senior year invest two weeks in the spay and neuter program of a busy urban humane shelter.

1) First, practice, practice, practice the manipulative techniques for suturing and ligating:

Once you understand the basic instrument handling and the standards for quality suturing and knot tying, regularly practice these skills until you can do them quickly and, for knot tying, without looking at your hands. Practice until you can produce beautiful ligatures and suture patterns quickly while in a surgical position (standing straight, elbows at sides, surgery site at navel level in front of you) without thinking or conscious effort. So that you don’t ingrain bad habits, occasionally have an instructor or experienced surgeon critique your results. Because you will be nervous during your first actual surgeries, initially you will lose finesse and speed so develop both beyond what you think you will need. For long term retention, over learn to the point that “muscle memory” develops. Shorter regular practice sessions distributed over days result in better long term memory consolidation than do investing the same time in fewer but longer practice sessions.

For decades human surgeons have developed their suturing skills by practicing on various inanimate objects and human foodstuffs, ranging from disposable exam gloves and cheap soft leather gloves to oranges to whole turkeys to pigs feet.

Historically Johnson & Johnson Ethicon has provided a knot tying kit, which has a request form here, free to students. Because the provided tying material is large, you should move on to more suture-like material as soon as you can and you should wear disposable exam gloves to more closely simulate the feel during surgery. A version of the Ethicon knot tying manual is on-line here (HSUS RAVS pdf) and the Ethicon wound closure manual is here.

Many suture kits are available, such as the less expensive The Apprentice Doctor, Nasco’s Life/form Suture Kit, and W3 Inspirations S.E.W.S Kit, and the more expensive Cine-Med Suture and Tying Kit and the SimuLab BOSS. Googling “practicing suturing kit” yields 350,000 hits and 6 targeted ads. You can obtain expired suture from eSuture.com and by asking.

For considerably less, you can assemble your own kit of disposable exam gloves (wear these to achieve a more realistic feel), needle holders (drivers) with scissors (you’re gonna use’em with scissors in practice so practice not cutting things you don’t want to cut now!), Adson thumb forceps with teeth, suture needles, a #3 scalpel handle, a few #10 scalpel blades, and practice on grocery store items.

Some examples of inexpensive on-line sources for practice instruments are AllHeart, Surgical123.com and Ted Pella. For example, floor grade Olsen-Hegar needle holders are ~$20. Because some of the gear used in fly fishing are inexpensive replicas of surgical instruments, another source is fly fishing shops. For example, Google the “Mitten Scissor Forceps,” which is typically priced at $19 and looks very much like a surgical needle holder. Fly shops and craft stores are good sources of monofilament nylon resembling suture material (tippet in fly shops). The higher test versions of the fishing line Spiderwire EZ Braid resembles braided suture material.

Much advice on how to go about this is available on-line, such as RookieDoc Sutures and Knots (practice, practice, practice), RAVS practical skills assessment (these are for beginning to do surgery on live animals, not for the new graduate!), medical student blogs (query 1, query 2), LARC guides, and medical school laboratory skill modules, such as Wayne State Dept of Surgery’s MS4 Advanced Surgical
Skills Elective modules. Medical students must develop significant skills before they are allowed to practice on patients.

A surgeon’s response to a Yahoo Medicine query about home practice material:

The quality of the material is completely inconsequential in regard to the practice of suturing. The most important aspect of placing sutures is proper tissue handling, instrument and tying technique, relative to the situation at hand. If one is suturing into strong tissue such as abdominal muscle fascia with a #1 vicryl, then a completely different amount of force is applied than if one is using a 5-0 prolene to close an opening in the vena cava. The placement of the needle through the tissue, however, and the attention paid to avoiding lateral stresses to the tissue by “following the curve of the needle” is key. When you tie down the knot, whether using instrument tying technique or hand tying, make certain that you snug the knot firmly but without over-cinching. "Approximate, don't strangulate!" is a slogan of wisdom now, just as it has always been. Bring the knot TO the tissue, and do not tension the tissue by pulling on the suture as the knot is tightened.

Here are some illustrative exercises: (I'm assuming you've been properly instructed in how to hand-tie suture using two-handed and one-handed technique, as well as instrument tie.)

1) Using a rubber exam glove, place a finger of the glove under a small weight on the table top. Use a small book, or for more challenge, use less weight such as a cell phone or even just a pen. With forceps and a needle driver, gently place a stitch into the glove. For glove material, I recommend a 3-0 silk. Now, tie the suture down firmly without pulling the glove out from under the weight. Once you have 3 or 4 knot throws, pick up the glove and look at your knot very closely. Did it cinch tight? Is it an "air knot"? Use a tine of your forceps and worm it into the suture below the knot, if you can. Can you pull the suture open, showing that your knot can slide? If you do this exercise correctly, you can show that your throws are "going down square" because the knot won't slide.

2) Take a Styrofoam coffee cup and poke a hole in the side, near the bottom. Worm the finger of a rubber exam glove from the outside into the cup so that as you look down into the cup, you see the finger protruding into the space. Grasp the tip of the glove finger with a pick-up and clamp across it with a right-angle Mixter clamp. Now, tie off around the finger using a free (silk) tie. Use whatever size you want, but again I recommend 3-0. When you're done, remove the glove from the cup and blow it up like a balloon. Can you prevent air from travelling distally into the finger tip? Is your tie-off "air tight"?

3) For giggles, peel an orange in one piece. Start at one end, gently tearing a large circle around the stem insertion point, but then continue down the orange as a spiral till you can lift off the far end as another circle. Now, sew the peel back together with a running subcuticular stitch. I recommend 3-0 vicryl on the SH needle. Don't use a pop-off needle. The secret is that you don't need to knot the suture at the beginning, just anchor the start by doing a couple of needle passes through the white underside, then when you run out of suture, cut off the needle and just start a new one. No need to knot! If you do this well, you can make the orange look PERFECTLY intact, but it's tougher than it sounds. The orange peel will show off any step-offs from asymmetric suture placements from one side of the gap to the other, and if your exits and entries aren't close to perfectly aligned across the gap, then when you gently cinch it down, the gap will gape. If you over-cinch in order to try to crush the flaws out of your suture line, the tissue will tear.
4) With a sharp knife (perhaps a scalpel), cut a grape in half. Now sew it back together with at least 4 interrupted sutures. I don't care how you hold the grape to do this, and the suture choice is an exercise left to you. There are two modes of failure. One is if your suture rips through. The other is if you tie so loosely that when you pick up the grape by one half, the other half sags or shifts.

The bottom line is that any practice is good practice as long as you practice good technique! If you start developing bad habits now, then you're going to be fighting to rid yourself of ingrained error. Work with surgeons to critique your skills, and remember, do as they SAY, not as they do... many surgeons will bend the rules a bit here and there when they know that the situation isn't critical. You, on the other hand, are in training. As such, rule bending isn't something you're privileged to do!

Another:

Over the last couple of summers, I spent vacations working with a CT surgeon. He taught me to practice suturing on roasted turkey breast you get from the deli - 0.5 inches thick sliced.

He said if you practice suturing and tying down knots *gently* without pulling through the turkey and shedding it up you'll do fine in the OR. Also, it's easier to learn to be gentle first then be more aggressive when needed - rather than learning to be gentle later on. This really seemed to work and *feels* more like real subq suturing to me.

An Attending’s response to a query:

The traditional thing to practice on is a pig's foot. You can get them at the supermarket, they aren't very expensive. Cut through the skin with a sharp knife and practice closing that way. For more realistic practice cut out an ellipse and close that so there is some tension.

I preferred whole chickens which are often also very cheap to buy and have more fascial planes deeper to practice on as well, but the skin is very flimsy and take a little more skill to get closed well.

I have also heard of people practicing on oranges on the rind. Can't say that I've tried this myself but it makes sense as phlebomotists often used to use these as models for blood draw practice.

Things to learn: You should be able to get the description from any surgery book so I'll focus on what you should look for as you practice. If you are looking for one with a good chapter, I recommend Chassin's Operative Strategy in General Surgery (it's about $150 so I'd see if your library has it and just photocopy the chapter, unless you plan to be a general surgeon in which case it's invaluable as a 1st atlas)

Opening and closing the needle driver. Practice. Nothing makes you look more like you know what you are doing than something who handles the instruments with confidence. Also, nothing runs a perfect stitch faster than being rough as you try to let go of the needle. Put one in your pocket and open and close it until it annoys your friends. Practice with your fingers in the holes and not in the holes (different attendings will prefer one or the other). Also practice loading needles about 1/2 to 2/3 of the way back on the curve of the needle.
Simple stitch. Practice by marking the two spots with a marker that you want to hit first to improve your needle control.

Simple baseball stitch. Start with this as it is easiest to learn. Focus on getting your stitches even in width and distance between them. This will help perfect your needle control. These are things that will serve you well when doing all other stitches.

Subcuticular stitch. The most common closing stitch that a student will be allowed to do. Practice finding the right plane just beneath the skin making sure not to penetrate the skin itself as you are making your stitch. Focus on getting your stitches straight across from one another, this will make the skin not gap and bunch making it look beautiful. To improve this, before you cut the skin you want to sew close, draw hash marks perpendicular to the planned incision and make sure you are matching stuff up.

Deep dermal stitch. Again, focus on getting exactly the right plane. If you do this stitch right, it'll seem like you don't even have to close the skin at that place.

Vertical and Horizontal mattresses. once you can do the above things, this will seem like a snap. You probably want to get someone to give you a live demonstration of one of these once, because sometimes the book descriptions don't really explain how these are placed well.

Good luck! Have fun practicing!

And you likely can find much more advice. Please let me know of good ones.

Remember that poultry commonly carry zoonotic pathogens, sort of the sterile field in reverse!

2) Invest at least two weeks in the spay-neuter program of a large humane society

Most humane shelters in large urban areas have successful, high volume pet adoption programs in which they spay or neuter these pets as part of the adoption process. To adopt out 5,000 animals per year, a shelter has to perform ~100 spays and neuters per week. Because dogs and cats are seasonal breeders, some times of the year are likely busier than others. So that you don’t slow down their processing any more than necessary, hone your manipulative skills well before you arrive. Perform well and you can gain significant experience in two weeks.

At the same time, you will gain significant exposure to well puppy exams and vaccinations, another significant aspect of mixed animal practice. Finally, because a major part of shelter medicine is the control of infectious diseases, you can learn a lot about the epidemiology of infectious disease in groups, the basic concepts of which are relatively species independent.

ASPCA Professional
- Shelter medicine
Humane Alliance
- Veterinary extern program
UC Davis Koret Shelter Medicine Program -
- information sheets
• reference library