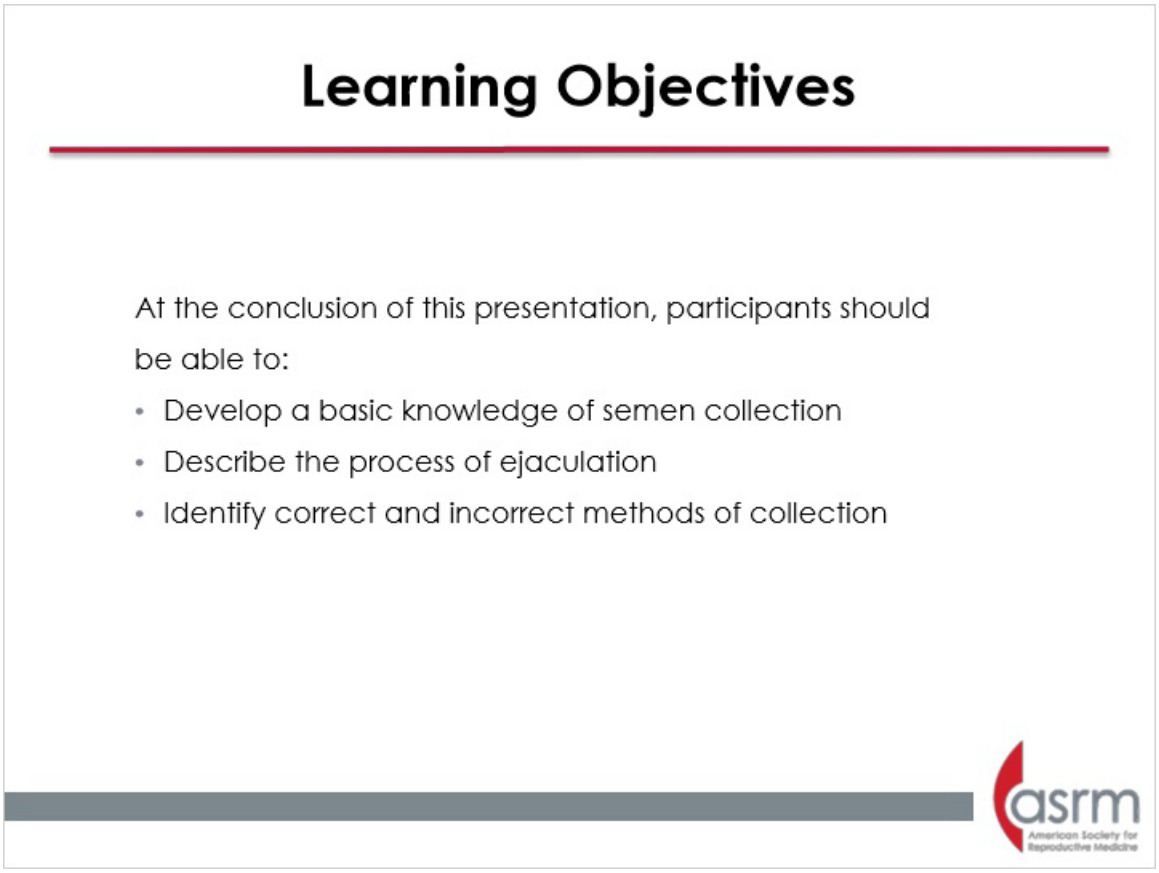
LABCC100 Lesson 16

1.1 Semen Collection: Methods, Receptacles, Optimal Period of Abstinence

Notes:

Welcome to the American Society for Reproductive Medicine's eLearning modules. The subject of this presentation is Semen Collection: Methods, Receptacles and Optimal Period of Abstinence.

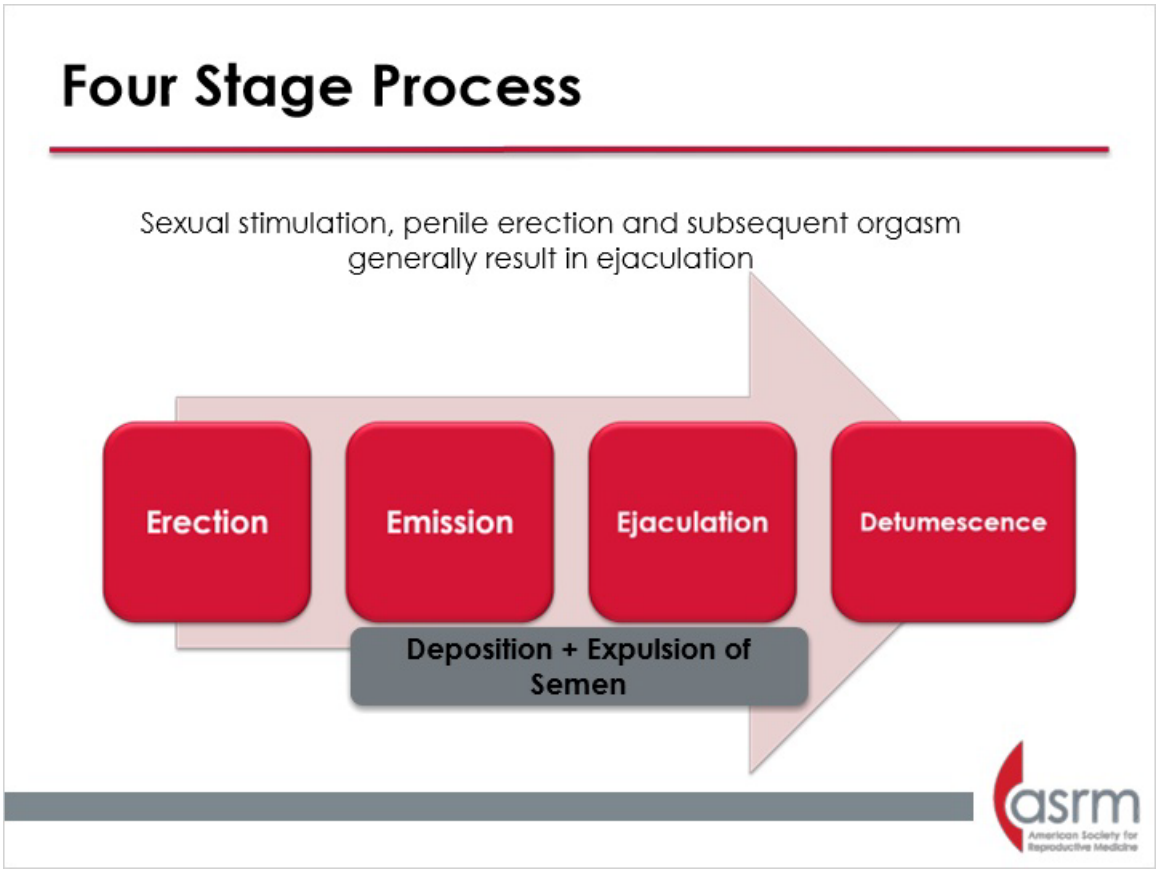
1.2 Learning Objectives



Notes:

At the conclusion of this presentation, participants should be able to: develop a basic knowledge of semen collection, describe the process of ejaculation and identify correct and incorrect methods of collection.

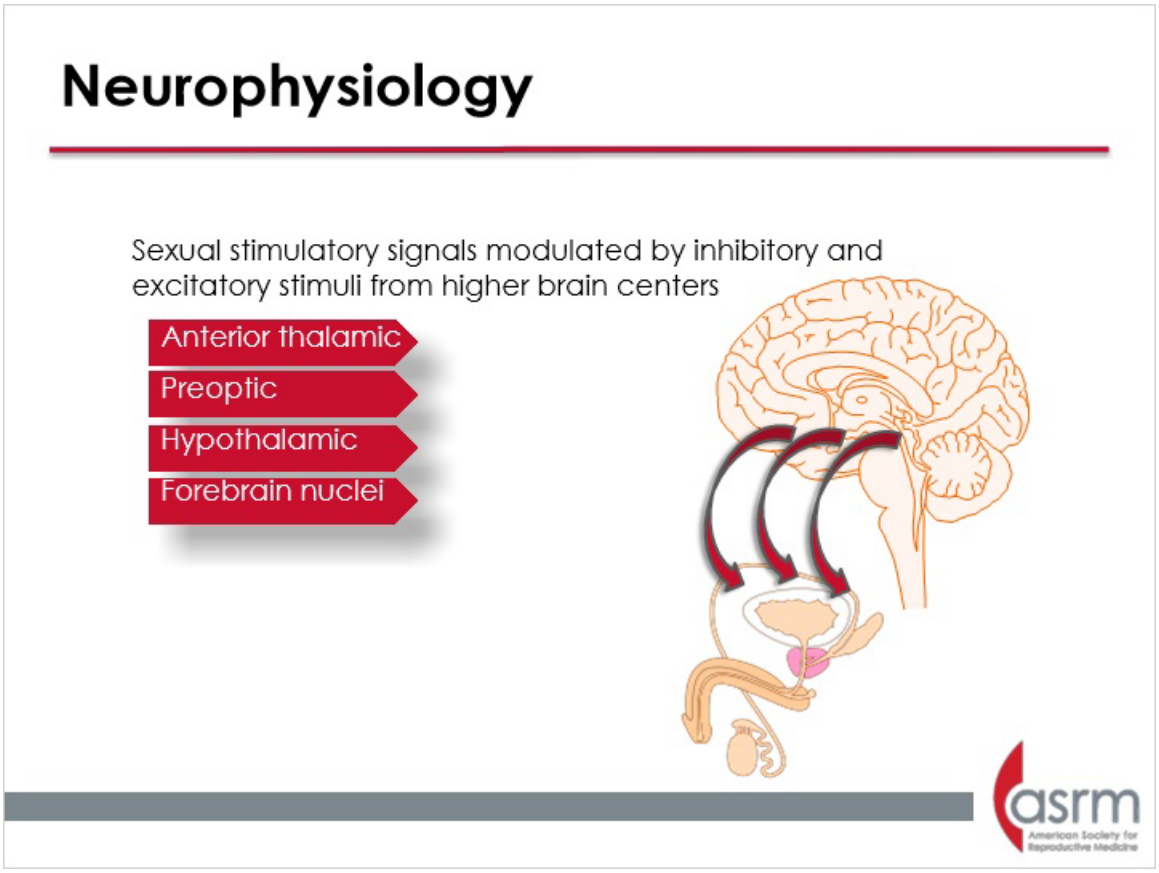
1.3 Four Stage Process



Notes:

Sexual stimulation, penile erection and subsequent orgasm generally result in ejaculation. This consists of four distinct stages: Erection through arousal, emission, ejaculation and detumescence. Emission and ejaculation are the two components responsible for the deposition and expulsion of semen, respectively. When successfully induced in a clinical environment, ejaculation provides a primary procurement source for sperm. Any difficulties with either or both of these functions will affect sperm quantity and quality.

1.4 Neurophysiology

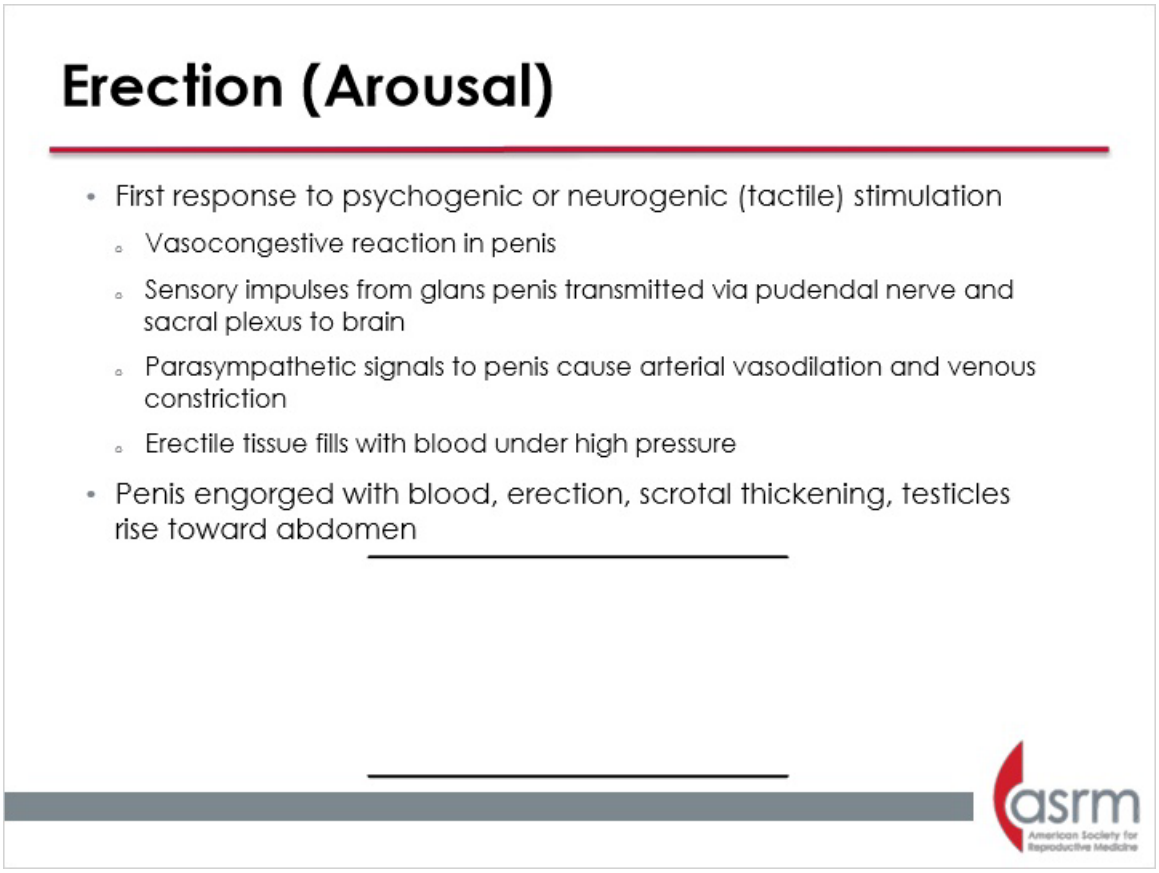


Notes:

The sexual stimulatory signals are modulated by inhibitory and excitatory stimuli from higher brain centers. These centers include the anterior thalamic, preoptic, hypothalamic and forebrain nuclei. Semen quality and quantity therefore at least partially depend on higher brain excitement levels.

In animal husbandry, bulls are teased by allowing them to mount a cow or a dummy a few times prior to ejaculate collection. Such continued higher brain stimulation increases the overall quality and quantity of ejaculate obtained. Similarly in humans, studies have demonstrated that seminal pouch collection during actual coitus yields better ejaculate than that obtained through masturbation alone.

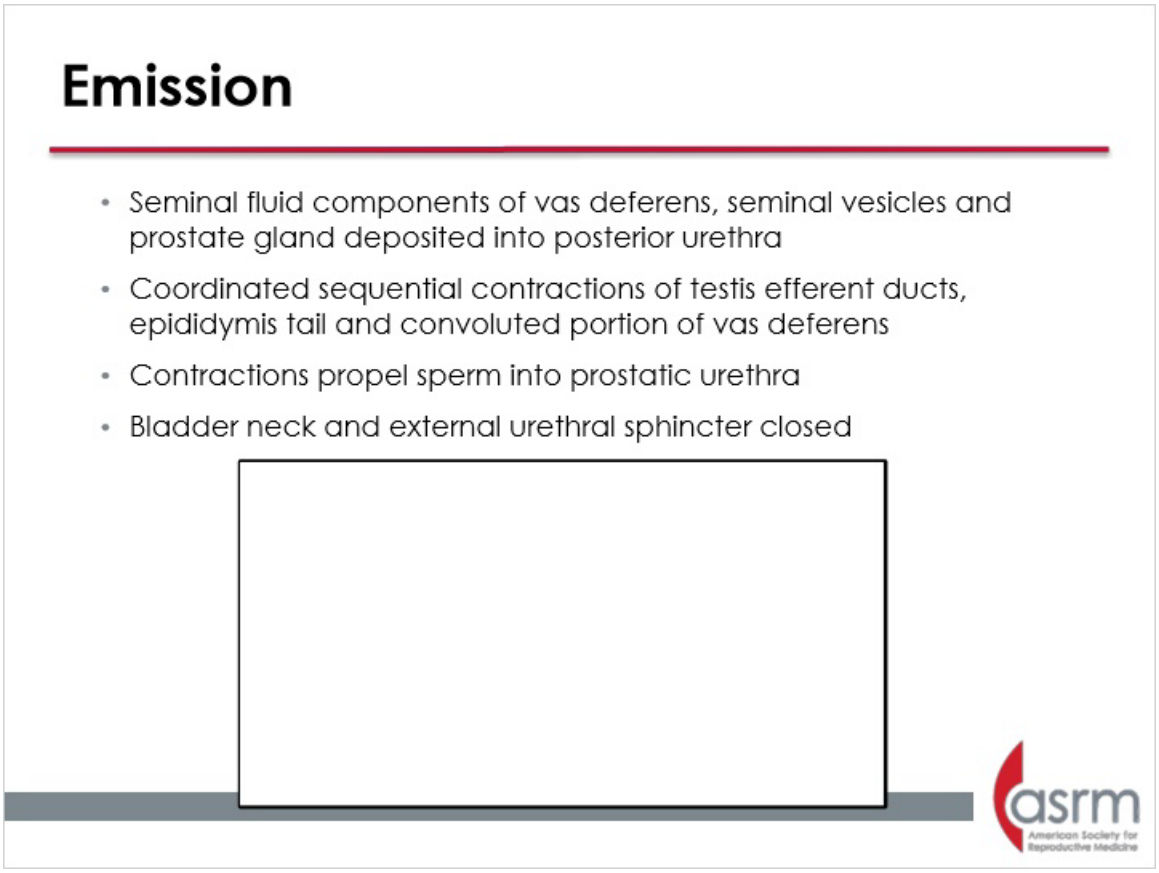
1.5 Erection (Arousal)



Notes:

Erection with arousal is the first response to psychogenic or neurogenic (tactile) stimulation and results in a vasocongestive reaction in the penis. Sensory impulses from glans penis are transmitted via the pudendal nerve and sacral plexus to the brain. Parasympathetic signals to the penis cause arterial vasodilation and venous constriction. The penis becomes engorged with blood and attains erection, the scrotum thickens and the testicles rise toward the abdomen.

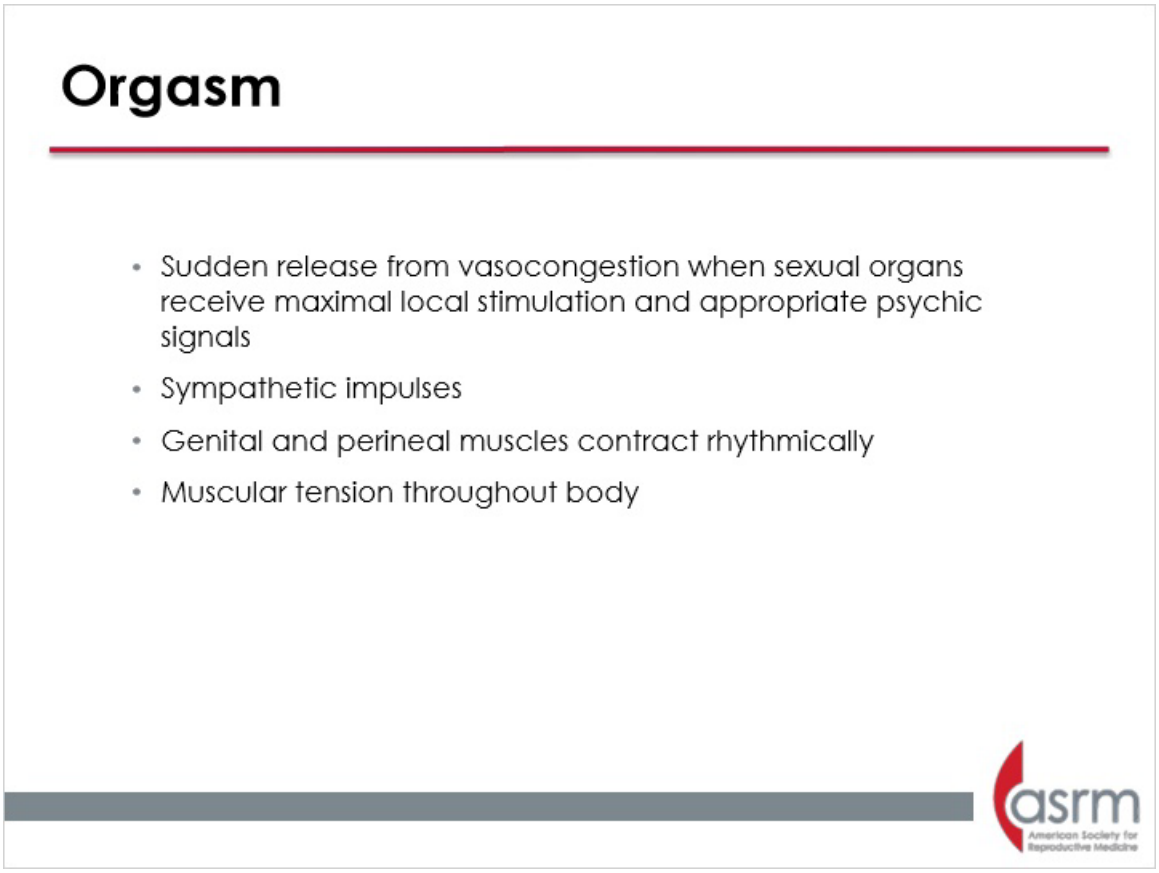
1.6 Emission



Notes:

During emission, the seminal fluid components of the vas deferens, seminal vesicles and prostate gland are deposited into the posterior urethra. There they mix with the mucus secreted by the bulbourethral glands. Emission begins as coordinated, sequential contractions originating in the testis efferent ducts, the epididymis tail and the convoluted portion of vas deferens. Contractions proceed in an integrated manner and propel the sperm into the prostatic urethra. During emission, the bladder neck and external urethral sphincter are closed to contain the deposited seminal fluid. Physical closure of the bladder neck is essential for the prevention of retrograde semen flow back into the bladder.

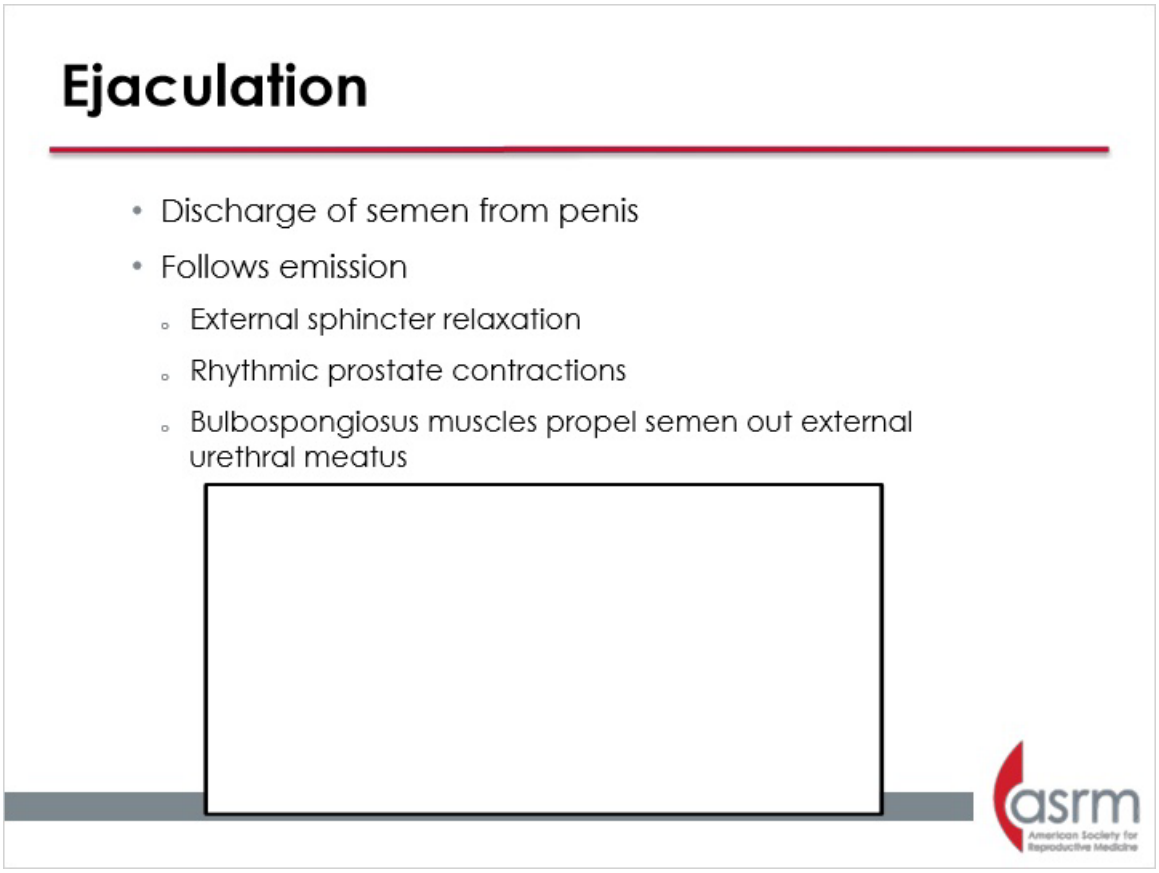
1.7 Orgasm



Notes:

The human orgasm is typically dependent upon a feedback mechanism between direct penile stimulation and excitation of various portions of the central nervous system. As such, orgasm is a vital component of the semen collection process. Orgasm is associated with ejaculation and occurs as a sudden release from vasocongestion when sexual organs receive maximal local stimulation and appropriate psychic signals. Sympathetic impulses initiate rhythmic contractions of genital and perineal muscles. Intense sexual signals to the brain lead to increased muscular tension throughout the body. Difficulties with orgasm inducement must be addressed or circumvented to facilitate any semen collection.

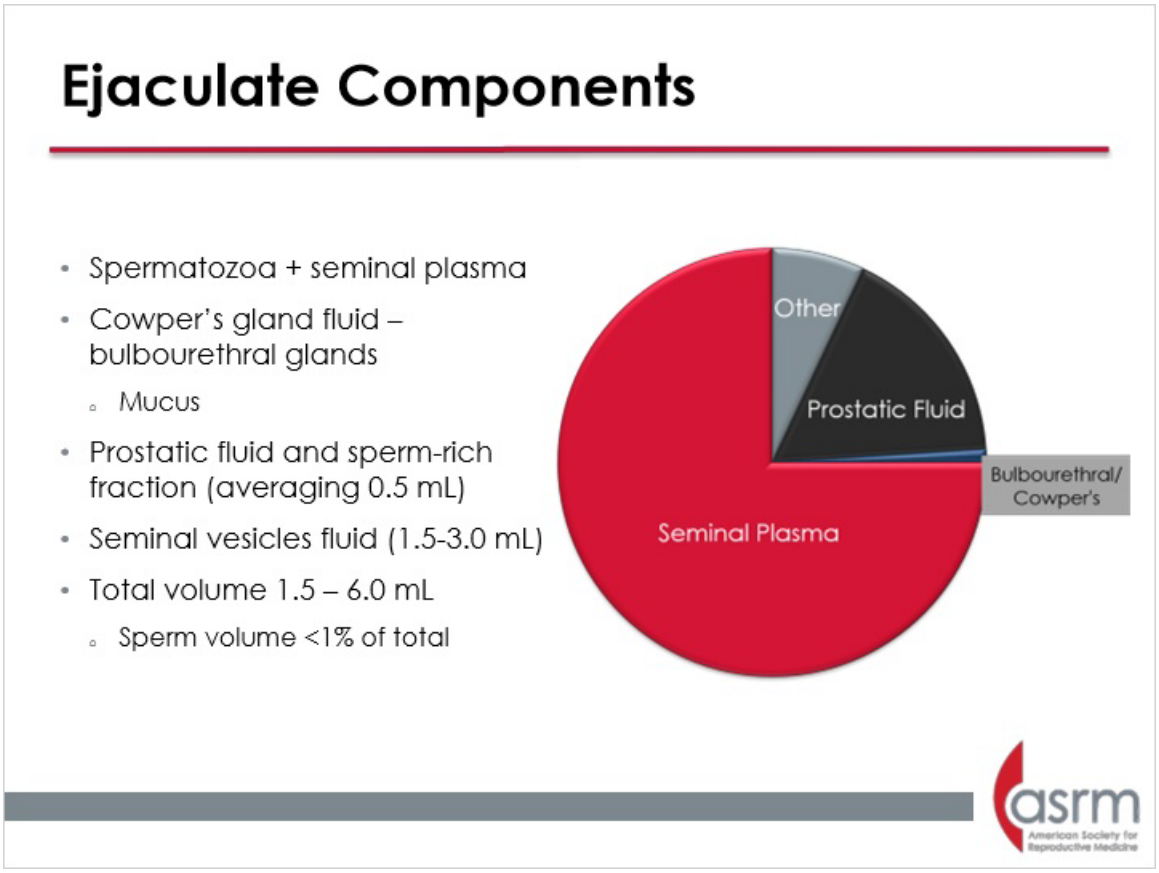
1.8 Ejaculation



Notes:

Ejaculation may be defined as the actual discharge of semen from the penis. The ejaculatory event follows emission and consists of external sphincter relaxation, followed by rhythmic prostate contractions. Bulbospongiosus muscles then propel the semen in an antegrade manner out the external urethral meatus.

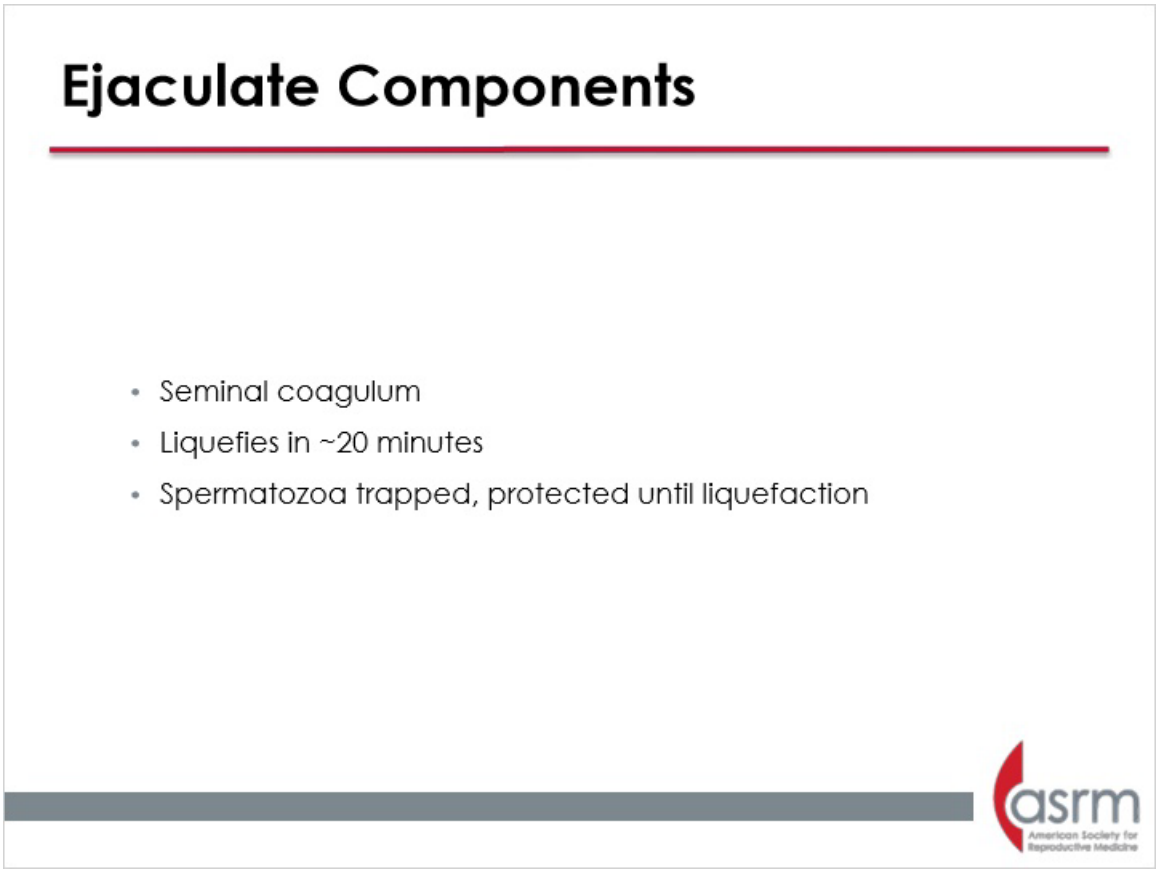
1.9 Ejaculate Components



Notes:

Spermatozoa produced in the testicles, when mixed with accessory sex glands' fluids, becomes *semen* (typically referred to as an "ejaculate," or simply as the "sample"). First, a small amount of Cowper's gland fluid is extruded from the bulbourethral glands. Next, the prostatic fluid and sperm-rich fraction from the ampulla and the vas deferens (averaging approximately 0.5 mL) is released. Finally the secretions of the seminal vesicles (averaging approximately 1.5-3.0 mL) are released sweeping out the remaining sperm. Overall sperm volume within an ejaculate is typically less than 1% (dependent upon other cellular components) of the total ejaculate volume ranging from 1.5 to 6.0 mL.

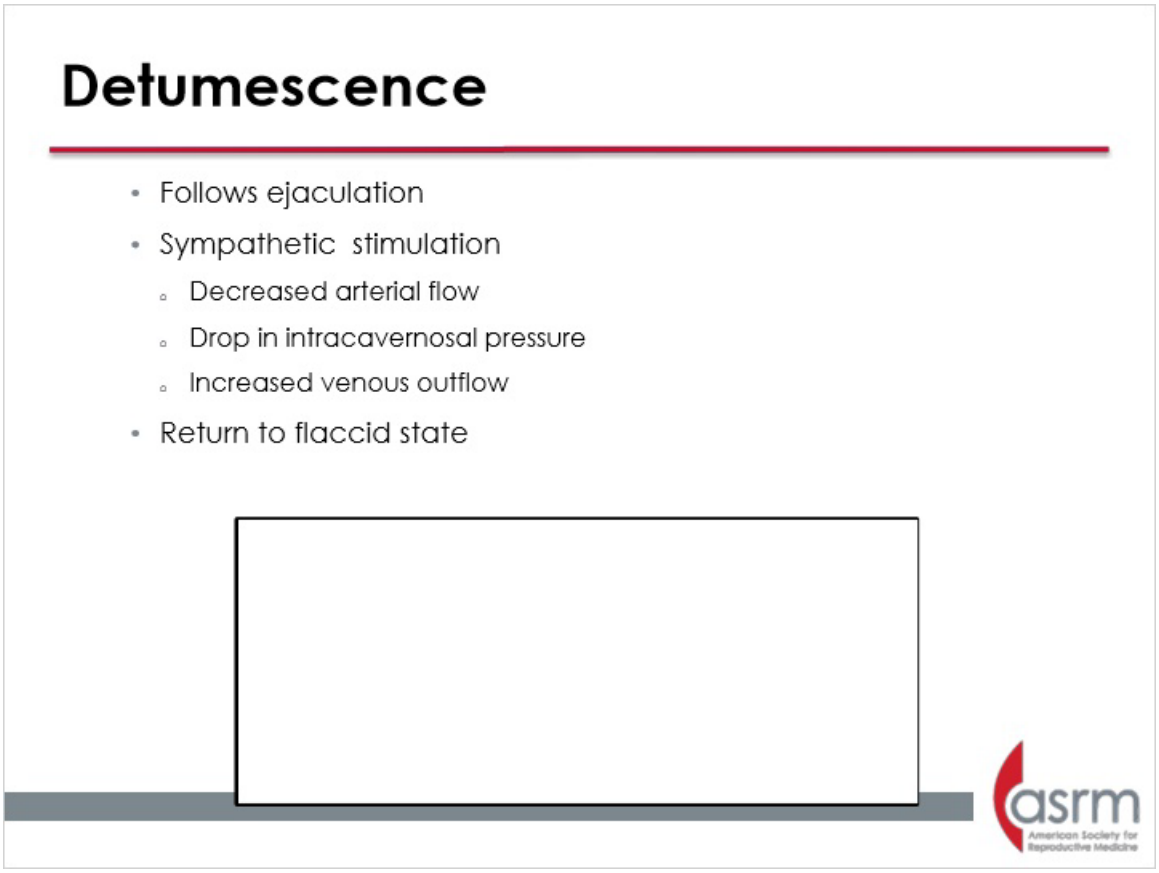
1.10 Ejaculate Components



Notes:

Following ejaculation, these heterogeneous portions become mixed, thereby forming a seminal coagulum. Normally, this gelatinous coagulum spontaneously liquefies in roughly 20 minutes or less. The spermatozoa are trapped and protected within this thick gel matrix, and remain relatively immotile until liquefaction. Any deviation in this natural ejaculation sequence will lead to compromised semen quality. Semen collection methods therefore become extremely important if the semen quality is compromised.

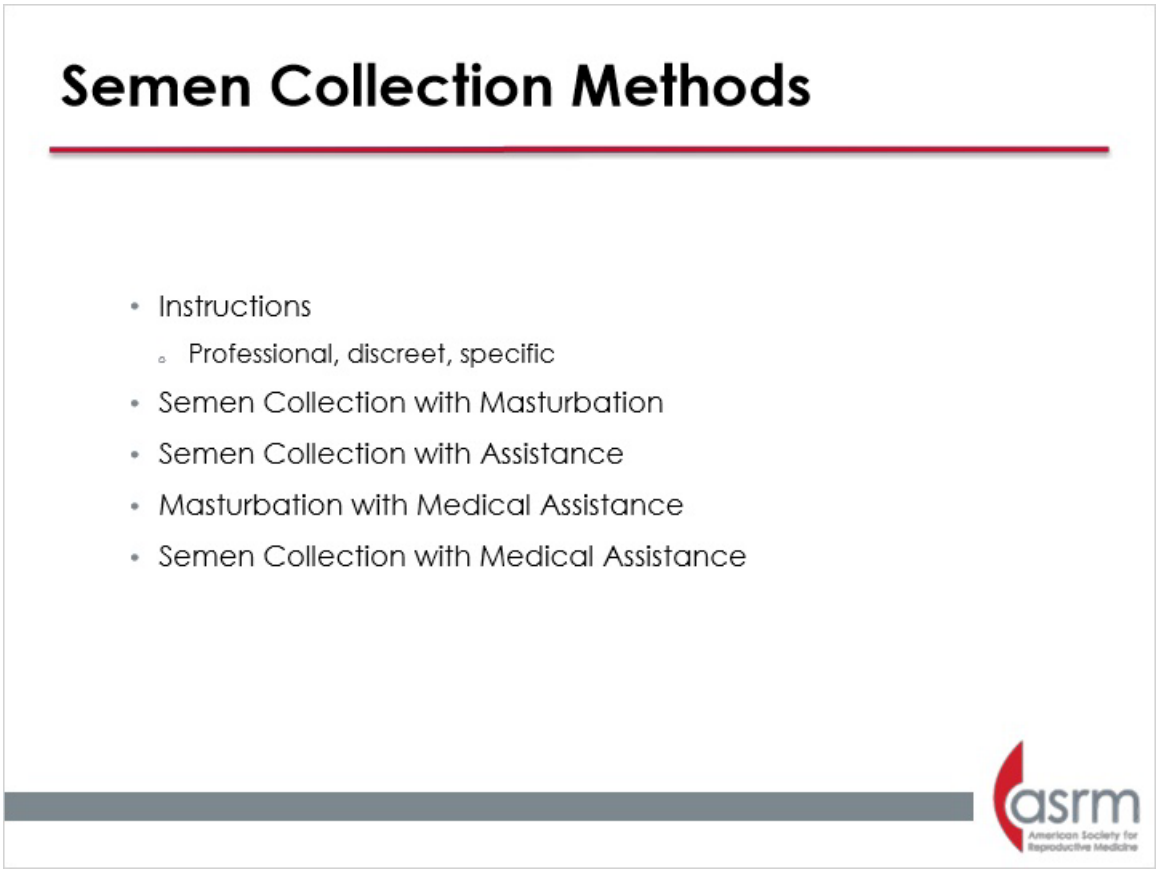
1.11 Detumescence



Notes:

Detumescence is the phase following ejaculation in which sympathetic stimulation leads to decreased arterial flow and intracavernosal pressure. Increased venous outflow allows relaxation of the erection and a return to the flaccid state.

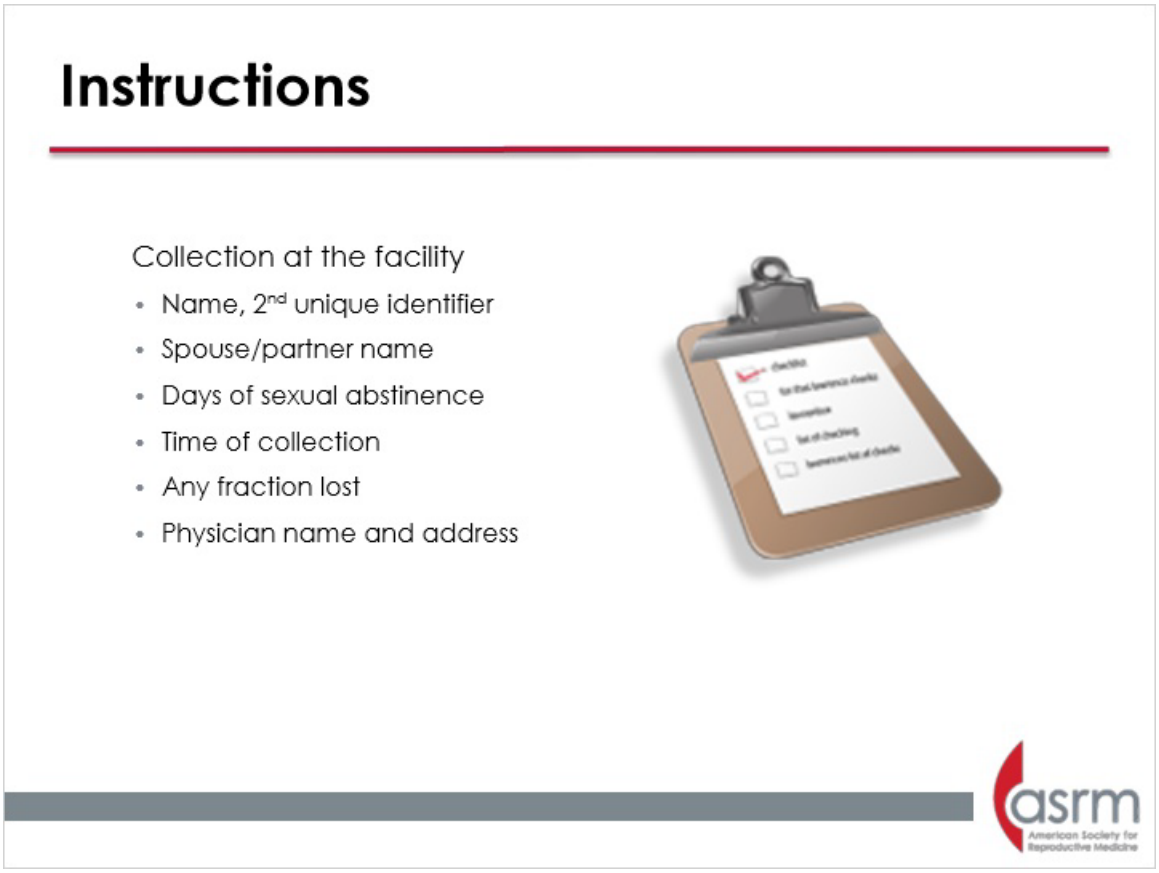
1.12 Semen Collection Methods



Notes:

Semen collection can be embarrassing for many men, and instructions must be professional, discreet and very specific. Four methods of semen collection will be discussed: semen collection with masturbation; semen collection with assistance; masturbation with medical assistance; and semen collection with medical assistance.

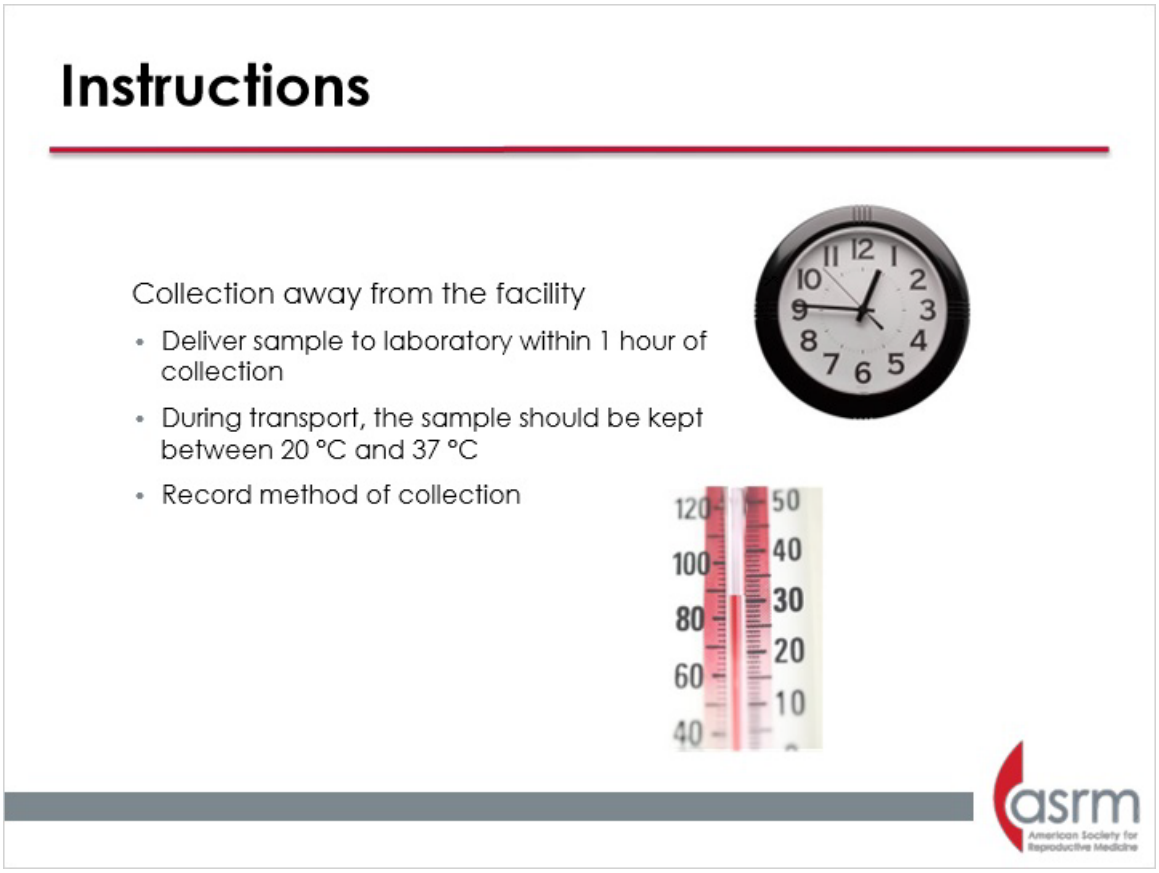
1.13 Instructions



Notes:

The man should be given clear instructions as to the collection procedure, including the recommended sexual abstinence period. He also should be asked to provide the following information: name and a second unique identifier, spouse/partner name, days of sexual abstinence, time of collection, any fraction lost and physician name and address. If the specimen is brought from outside the facility, then the method of collection should be recorded.

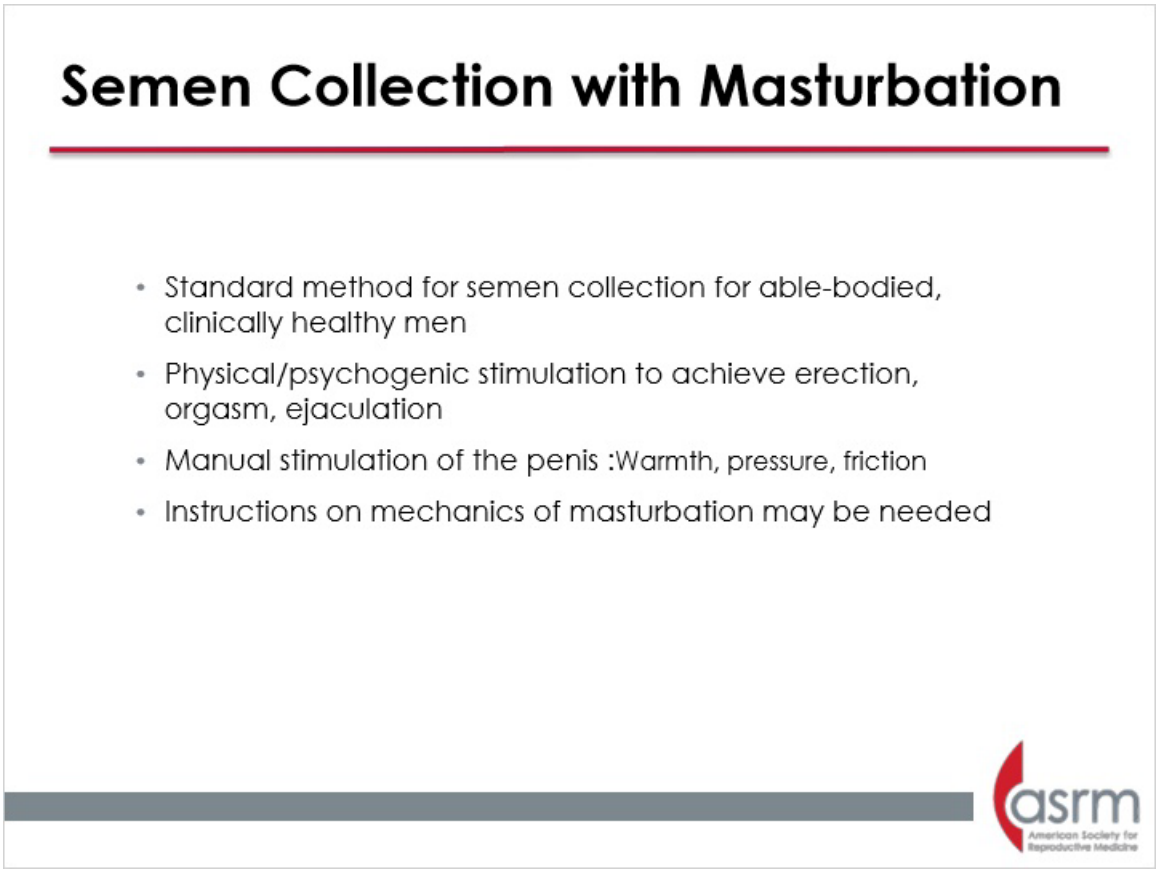
1.14 Instructions



Notes:

Clear instructions as to the delivery time and transport temperature should also be provided. The sample should be delivered to the laboratory within one hour of collection. During transport, the sample should be kept between 20°C and 37°C. The method of collection should be recorded.

1.15 Semen Collection with Masturbation



Notes:

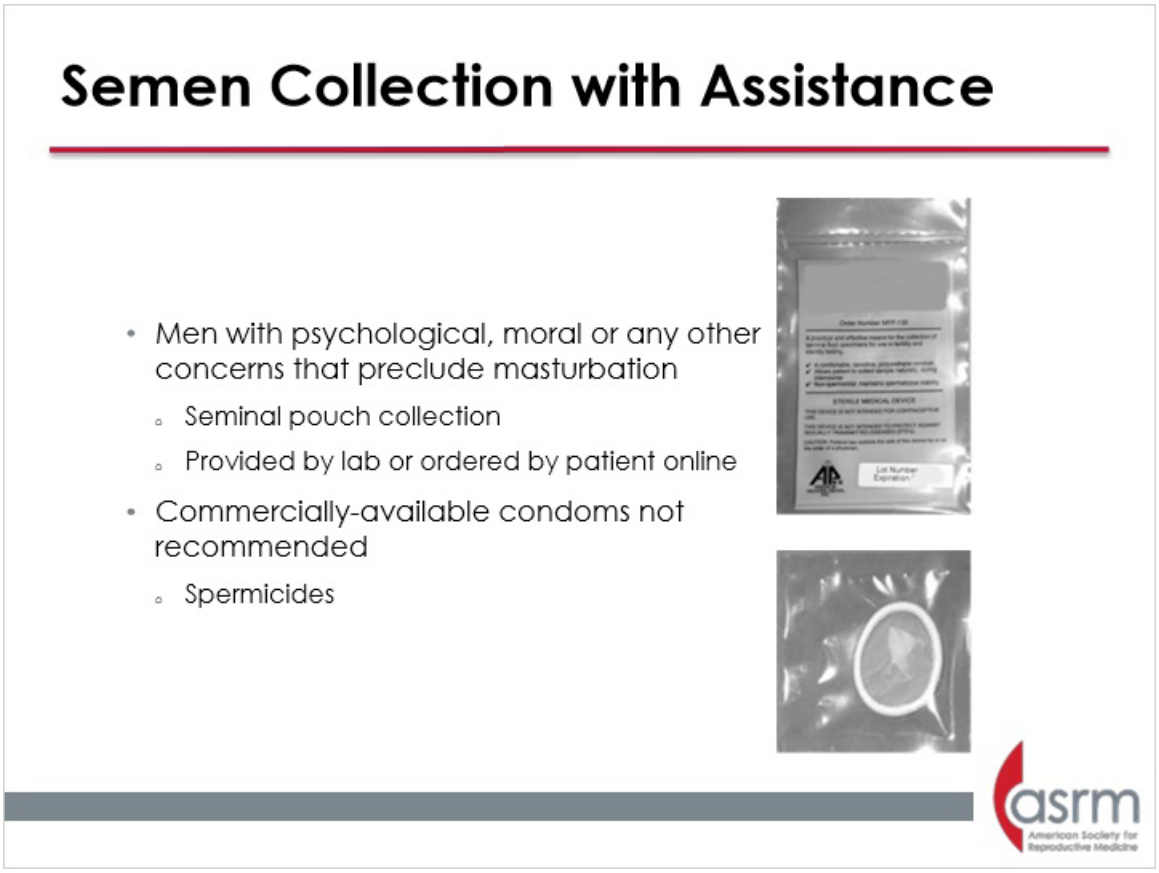
For able-bodied, clinically healthy men, masturbation is a standard method for semen collection, and remains a relatively simple, popular procedure.
The penis, as the primary male sex organ, responds to an interplay and feedback mechanism between physical and psychogenic forms of stimulation. Under normal circumstances, erection, then orgasm (culminating in ejaculation) is realized through adequate sensory stimulation and neurological feedback.
Masturbation is a procedure facilitated through manual stimulation of the penis to induce ejaculation. The penis responds to warmth, pressure and friction. Although all three factors are important, their relative significance is, interestingly enough, species-dependent. Humans prefer friction for masturbation. Of all possible sperm procurement methods, masturbation is the most practical and recommended collection method. However, there may be men who need detailed instructions on the mechanics of masturbation.

1.16 Semen Collection by Masturbation

Notes:

Semen collection should be conducted in a private room, preferably with an adjacent washroom, away from any commotion or distraction. The man should be instructed to clean the penis and glans penis area with a wet paper towel, and delicately wipe dry. Soap should be avoided as it is detrimental to sperm. If lubrication is absolutely necessary to obtain ejaculation, any lubricant that does not contain a spermicide is acceptable, avoiding use on the glans penis.

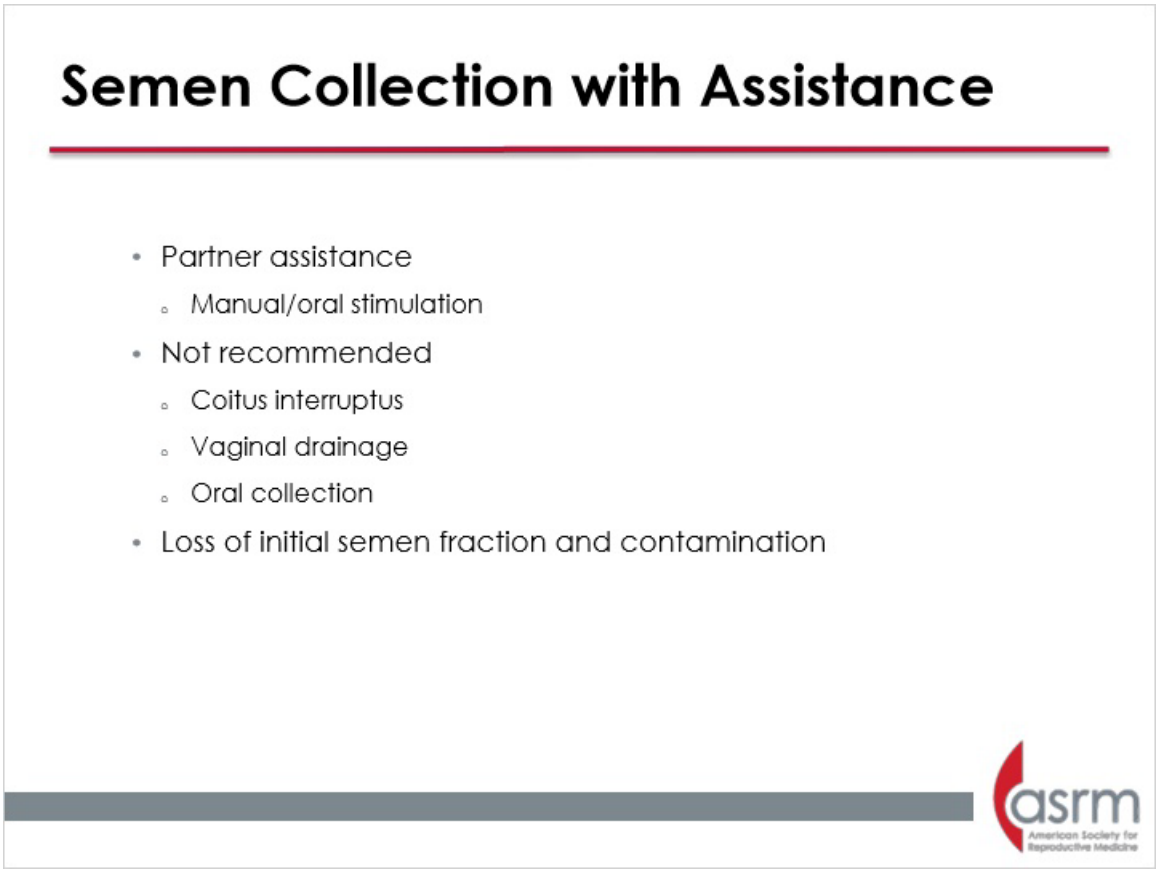
1.17 Semen Collection with Assistance



Notes:

Some men have psychological, moral or other concerns that may preclude their ability or willingness to masturbate. For these men, collection using a seminal pouch can be recommended. Seminal pouches/semen collection condoms may be provided by the laboratory or ordered by the patient online; no prescription is required. Note that most commercially-available condoms contain spermicidal agents that may compromise or even destroy sperm quality, and should be avoided.

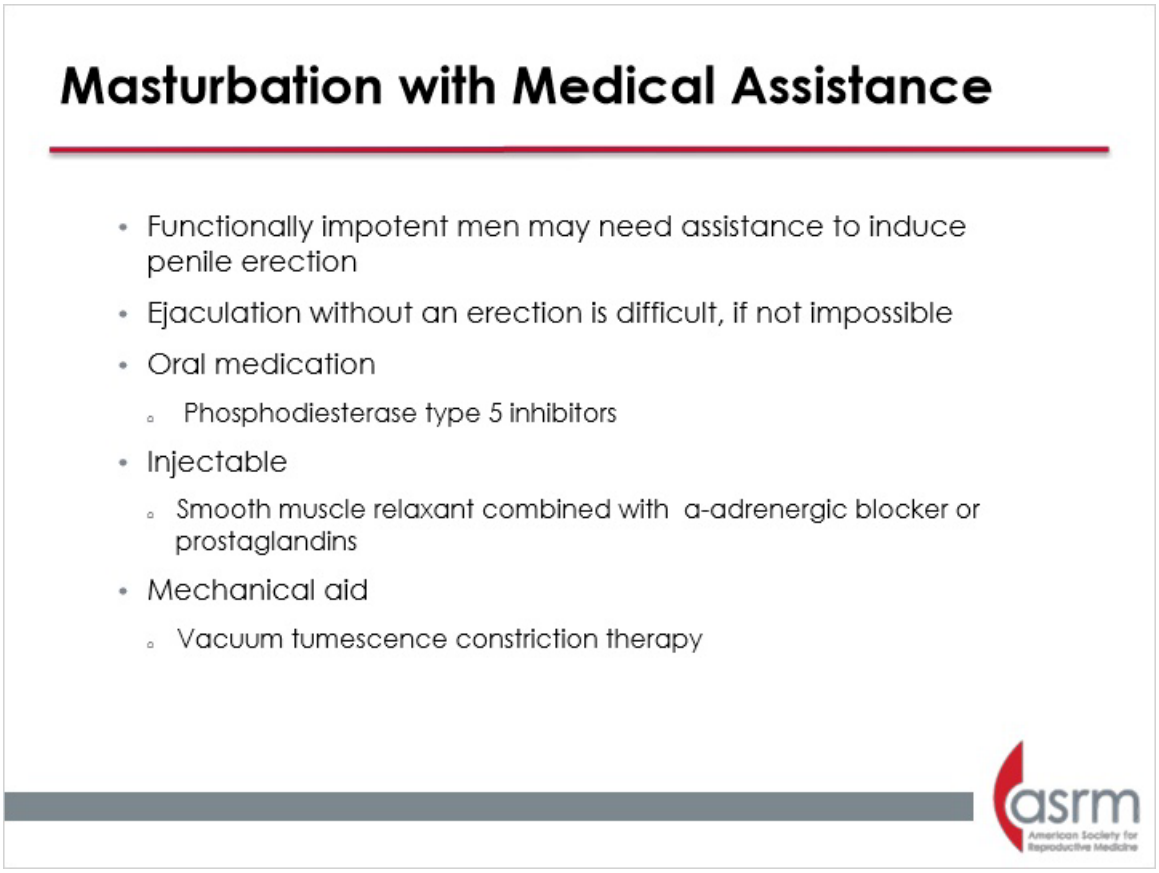
1.18 Semen Collection with Assistance



Notes:

Partner assistance with manual or oral stimulation may be helpful for the man with difficulty obtaining a specimen by masturbation.
Although not clinically recommended, another semen procurement technique not involving masturbation is coitus interruptus. Following coitus interruptus, ejaculation should occur inside a collection container, which is then immediately delivered to a laboratory for analysis. Similarly, vaginal drainage immediately following intercourse into a collection container is also possible. Both of these methods involve the loss of the initial semen (sperm rich) fraction and contamination with acidic vaginal fluids. Oral semen collection is similarly not recommended.

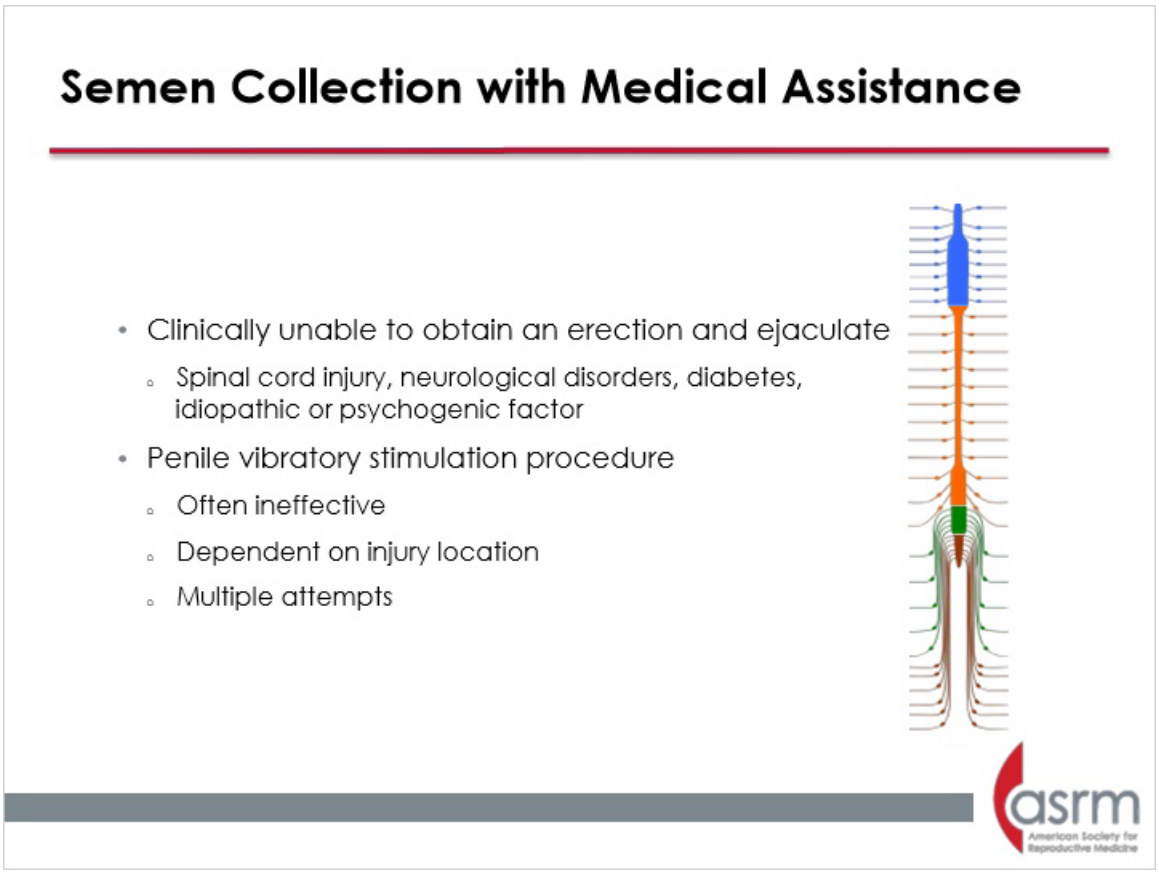
1.19 Masturbation with Medical Assistance



Notes:

In certain medically-challenged situations, such as diabetes or psychosomatically-related illnesses, the man is functionally impotent, therefore unable to obtain an erection. Ejaculation without an erection is difficult, if not impossible**.**
Consequently, some assistance is required to precipitate an erection, and thereby procure a sufficient ejaculate through masturbation. To induce penile erection, oral medication such as phosphodiesterase type 5 inhibitors, which are commonly utilized to treat varying degrees of erectile dysfunction, may be taken prior to attempting to masturbate. Similarly, a non-specific smooth muscle relaxant combined with an α-adrenergic blocker or prostaglandins may also be injected alone or in combination. There are also devices designed to mechanically aid erection such as vacuum tumescence constriction therapy.
Although these procedures facilitate erection, direct physical genital stimulation, typically coupled with neurological feedback, are both still necessary sources of stimuli to achieve an erection (hopefully culminating in ejaculation). Should orgasm not culminate in ejaculation at this point, other clinical factors might be complicating the etiology.

1.20 Semen Collection with Medical Assistance

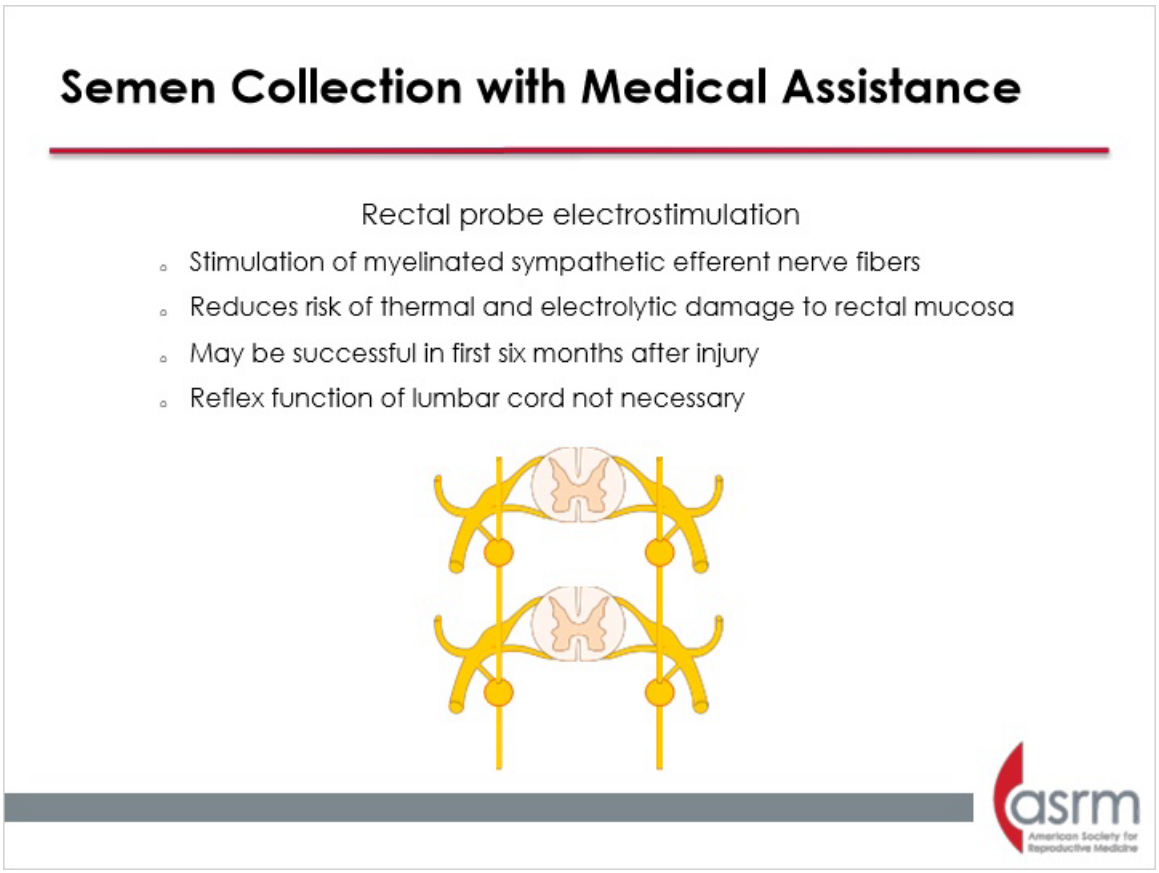


Notes:

Under certain clinical conditions, such as in the case of spinal cord injury, neurological disorders, diabetes, or idiopathic or psychogenic factor, the man is unable to obtain an erection or ejaculate. Regardless of origin, however, anejaculation presents particular challenges for semen procurement, since the primary delivery mechanism of the male reproductive system has become inoperative. Vibratory stimulation of the penis may induce a reflexive ejaculation. Unfortunately, these techniques have proven mostly ineffective during the first six months following spinal injuries, and have failed entirely for men lacking the capacity for reflex hip flexion.

For men with spinal cord injury, procedural success is typically dependent on injury location. Spinal cord lesions in areas T8 or above might tolerate such artificially-induced ejaculations, whereas any injury to lower vertebrae typically precludes all such attempts. The vibratory stimulation procedure might require several attempts before ejaculation can occur. This procedure can yield viable semen, but the technique is not always practical, or even feasible. In such instances, rectal probe electrostimulation might be necessary.

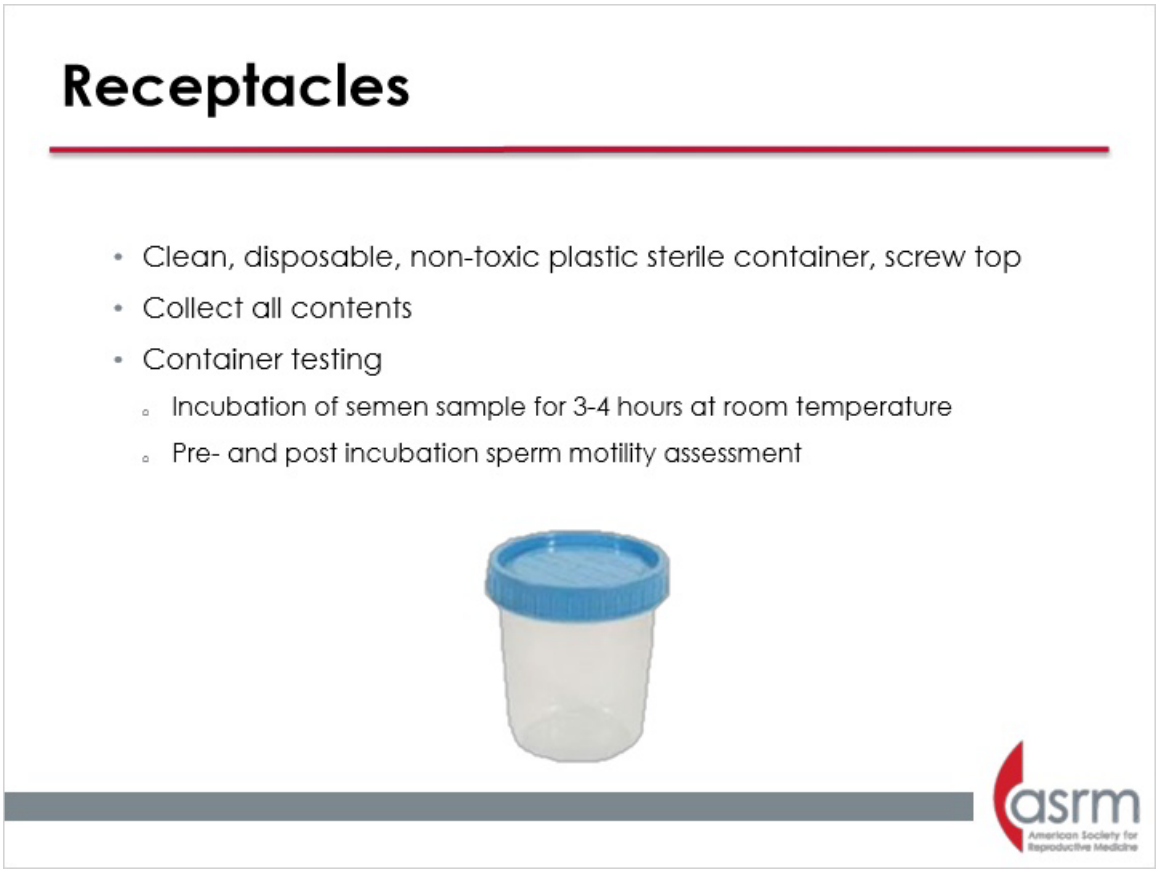
1.21 Semen Collection with Medical Assistance



Notes:

Ideally, the rectal probe electrostimulation will affect only those nerve fibers vital to completion of the procedure. By limiting stimulation to these myelinated sympathetic efferent fibers of the hypogastric plexus, this procedure reduces the risk of thermal and electrolytic damage to the rectal mucosa. Unlike the vibratory stimulation procedure, rectal probe electrostimulation may prove successful within the first six months following a spinal injury. The procedure appears to succeed on a large proportion of men with spinal cord injury, since rectal probe electrostimulation requires survival of at least the T10-L2 segments. Similarly, reflex function in the lumbar cord is not necessary.

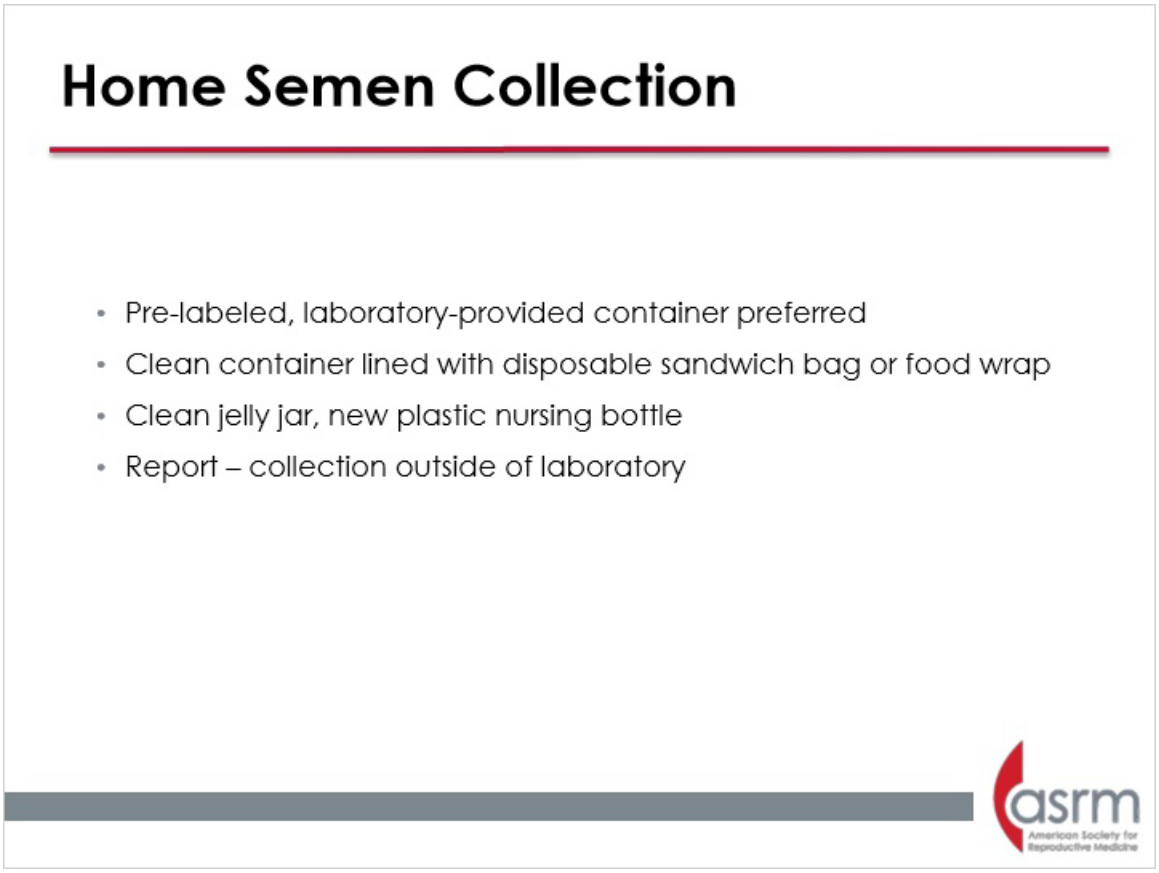
1.22 Receptacles



Notes:

The man should ejaculate into a clean, sterile container, provided by the laboratory, taking care that all ejaculate contents are collected. The ideal sample collection container is a disposable, non-toxic plastic container with a screw cap.
To evaluate the suitability of a specimen container, incubate a good quality semen sample in that container at room temperature for 3 to 4 hours. At the end of the incubation, assess sperm motility. If there is no significant difference between the initial and the incubated sample value, then repeat the procedure with several other good quality semen samples. If similar results are observed, then the collection container may be used for routine semen collection.

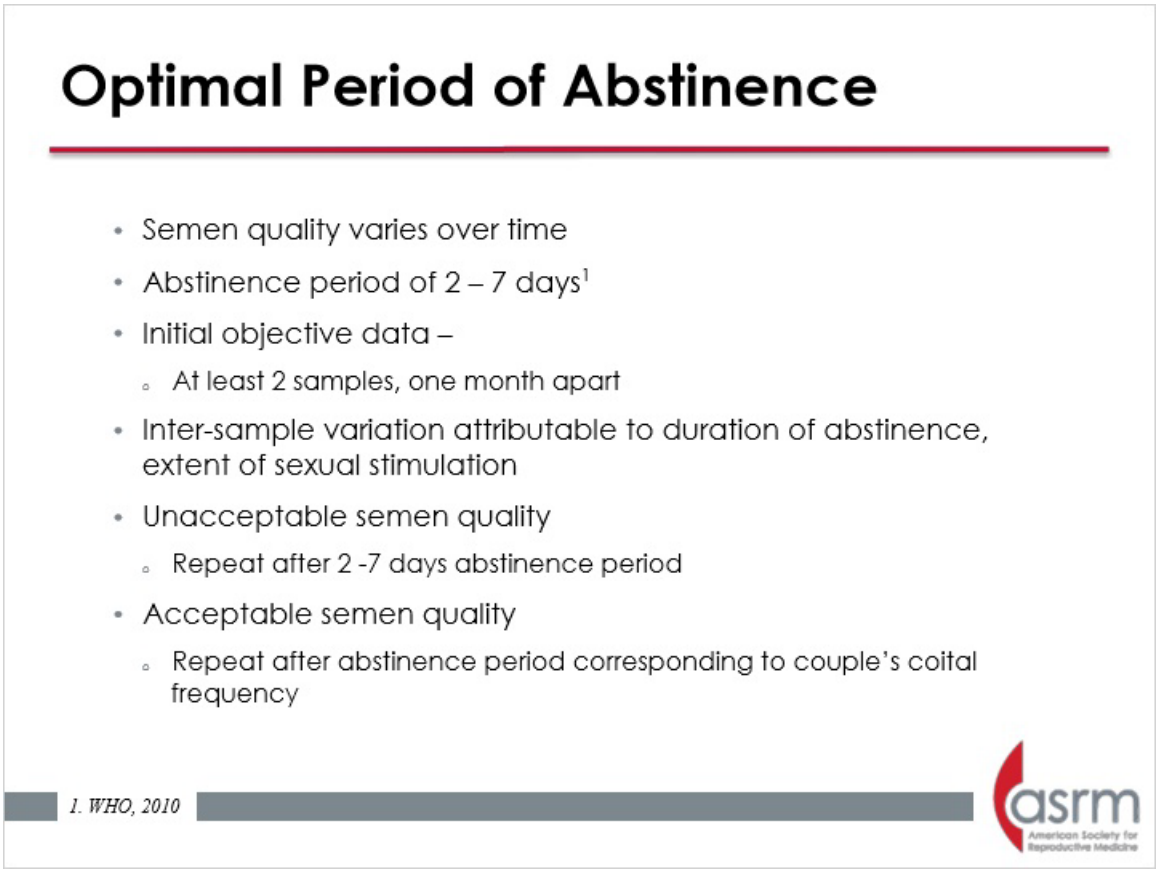
1.23 Home Semen Collection



Notes:

For home collection, a pre-labeled, laboratory-provided container is preferred. If measuring semen volume by weight, the container should be pre-weighed. If no sterile or clean container is available, a container lined with a commercially-available clear disposable sandwich bag or food wrap is acceptable. Samples collected in clean, empty jelly jars or new plastic nursing bottles are sometimes acceptable, but only if these containers are thoroughly cleaned prior to use. Otherwise, sperm quality may be compromised. The semen report should note that the sample was collected outside the laboratory.

1.24 Optimal Period of Abstinence

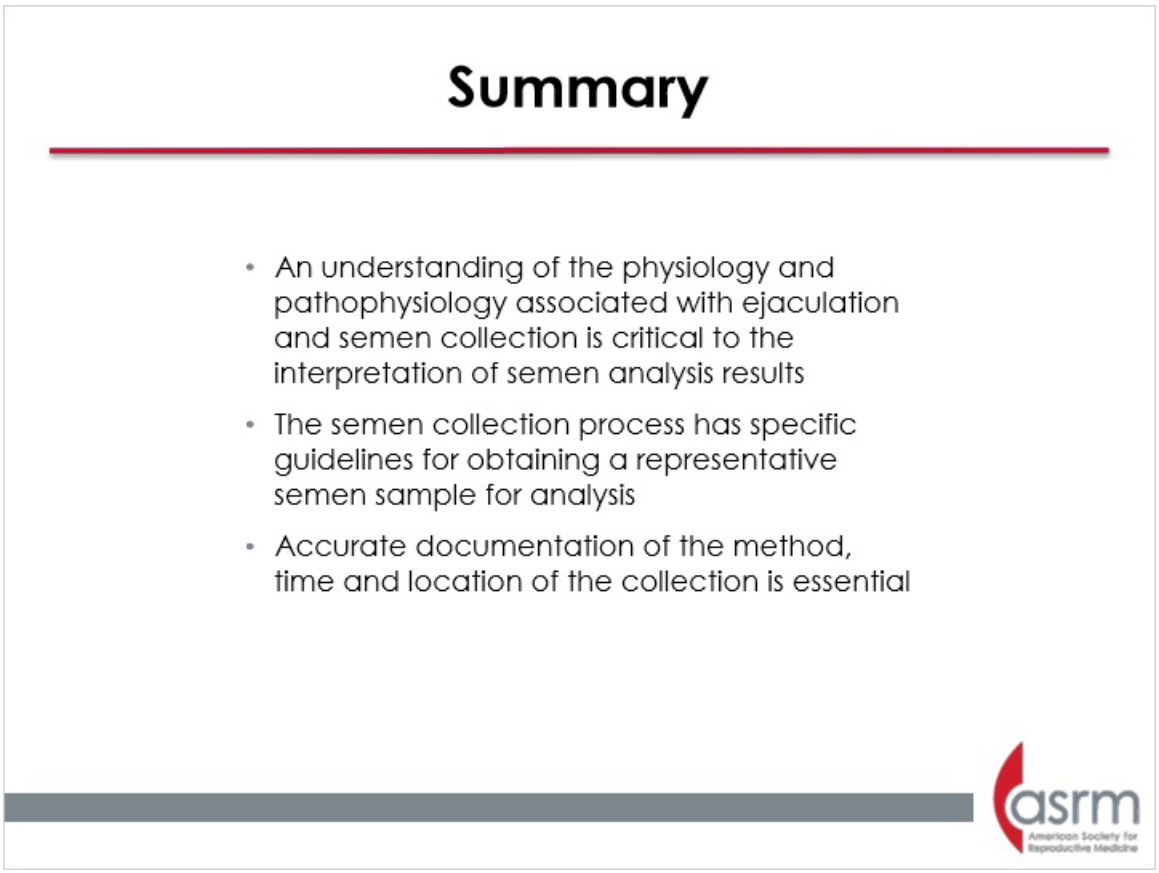


Notes:

Sperm are continuously being produced and accumulate in the cauda epididymis and these sperm are not expelled completely during ejaculation. This may also explain why sperm in an ejaculate have varying quality, probably due to age. Thus, semen quality varies over time. During fertility treatment, semen quality should be monitored at least once or twice a year.
The sexual abstinence period of two to seven days is based on the sexual abstinence period of control subjects to obtain the reference values for various semen parameters.
Several ejaculates from the same subject need to be analyzed to obtain objective data. Optimally, ejaculates should be analyzed every two or three weeks. For convenience, at least two ejaculates should be analyzed one month apart. If either one of these two ejaculates shows abnormalities, additional ejaculates should then be studied to better assess the clinical diagnosis.
Inter-sample variation is mostly attributable to duration of sexual abstinence and extent of sexual stimulation between samples. A semen specimen should therefore be collected by masturbation after the standard sexual abstinence period recommended for semen analysis of two to seven days.
If the semen quality is not acceptable with the two to seven days of sexual abstinence time frame, then another semen sample should be collected following a similar abstinence period to confirm the findings. If however, the semen quality is acceptable, then another semen sample should be collected after a sexual abstinence period corresponding to the couple's usual coital

frequency, thereby obtaining a more realistic assessment of typical semen quality for that couple.

1.25 Summary



Notes:

In summary, an understanding of the physiology and pathophysiology associated with ejaculation and semen collection is critical to the interpretation of semen analysis results. The semen collection process has specific guidelines that must be followed for obtaining a representative semen sample for analysis. Finally, accurate documentation of the method, time, and location of the sample collection is essential.

1.26 We hope you enjoyed the

Notes:

Thank you for participating in this educational activity.