MSK II MODULE
Comparison Of Three Types Of Muscles

Small Group Discussion

Dr. Maryam Abbas

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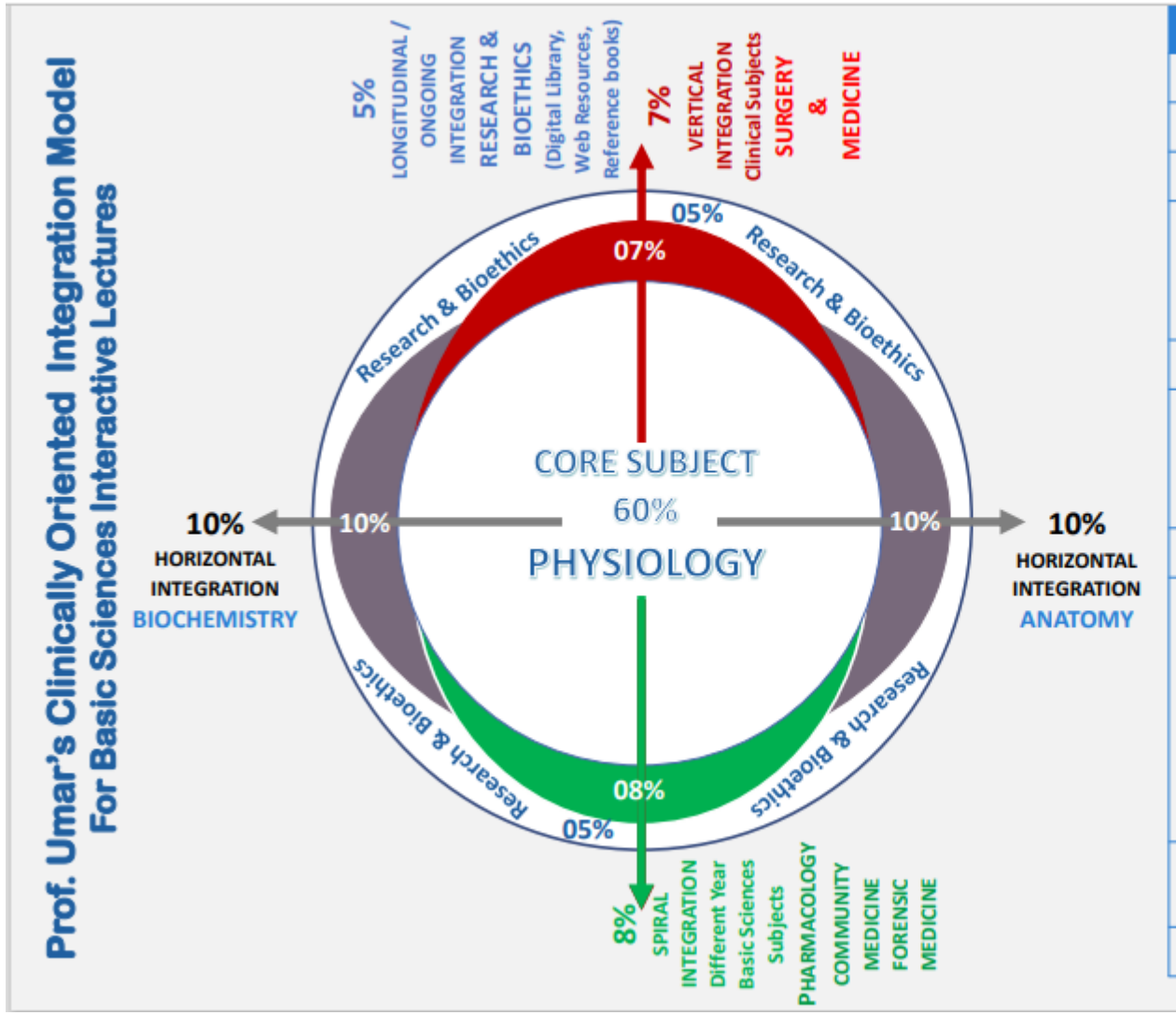
General Format for Large Group Interactive Session of Physiology:

S. No.	Headings	Domains/Type of Integration	Approximate %
1.	Title	• Introduction of GIT • Concept about it's Electrical Activity • Enteric Nervous System & GIT Reflexes	Lecture No.1 out of 10
			slide
3.	Physiologic Anatomy (Histology)	• Brain Storming/ Horizontal Integration • Interactive	15%
4.	Core Concepts of the Topic	Core concepts of Physiology	60%
5.	Concept explained through Animations	Core Concepts of Physiology	10%
	topic with key	• Interactive	
7.	Research article relevant to the topic with reference	• Promotion of research culture • Use of Digital Library • Critical Thinking • Self-directed Learning	5%
8.	PM&DC Code of Ethics/Professionalism/Communication Skills with reference	• Professional Ethics • Self-directed Learning • Interactive	5%



Model 1st Year PHYSIOLOGY LGIS (≈30 slides)	
Core Subject – 60% (≈ 18-20 slides)	
Physiology(≈ 18-20 slides)	
Horizontal Integration – 20% (≈ 5-6 slides)	
Same Year Subjects	• Anatomy (10%) (≈ 2-3 slides) • Biochemistry (10%) (≈ 2-3 slides)
Vertical Integration – 07% (≈ 2-3 slides)	
Clinical Subjects	• Medicine (3-5%) (≈ 1-2 slides) • Surgery (3-5%) (≈ 1-2 slides)
Spiral Integration – 08% (≈ 2-3 slides)	
Different Year Basic Sciences Subjects	• Pharmacology(1-3%) (≈ 1-2 slides) • Community Medicine (1-3%) (≈ 1-2 slides) • Forensic Medicine (1-3%) (≈ 1-2 slides)
Longitudinal / Ongoing Integration – 05% (≈ 1-2 slides)	
Research, Bioethics & AI(≈ 1-2 slides)	

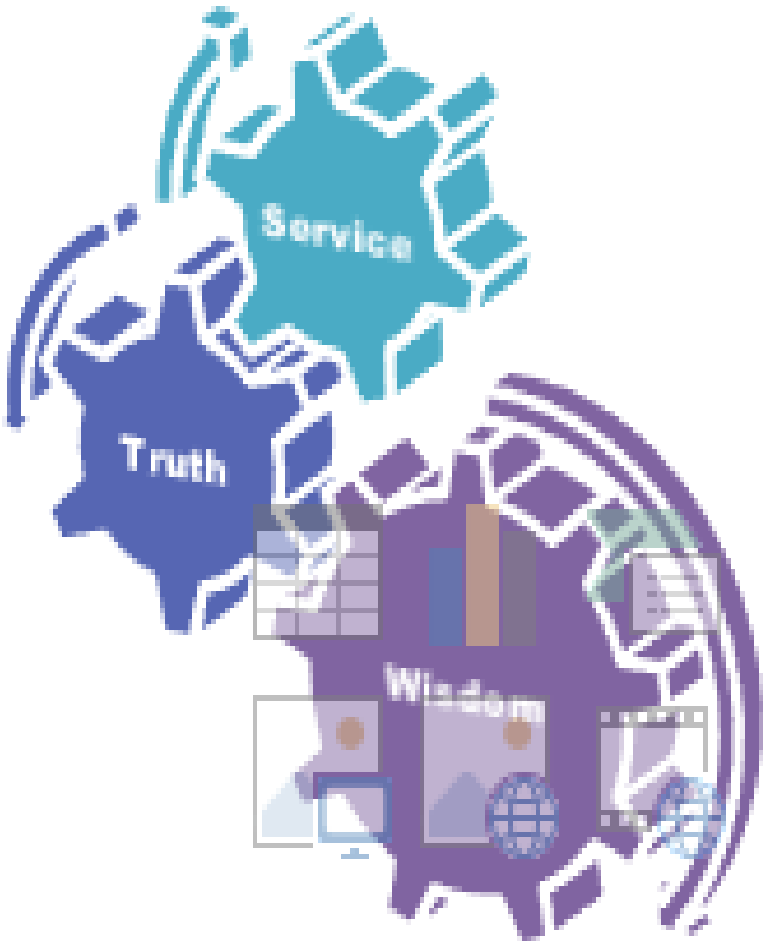
comparison of three types of muscles

Vision; The Dream/Tomorrow

To impart evidence-based research oriented medical education

To provide best possible patient care

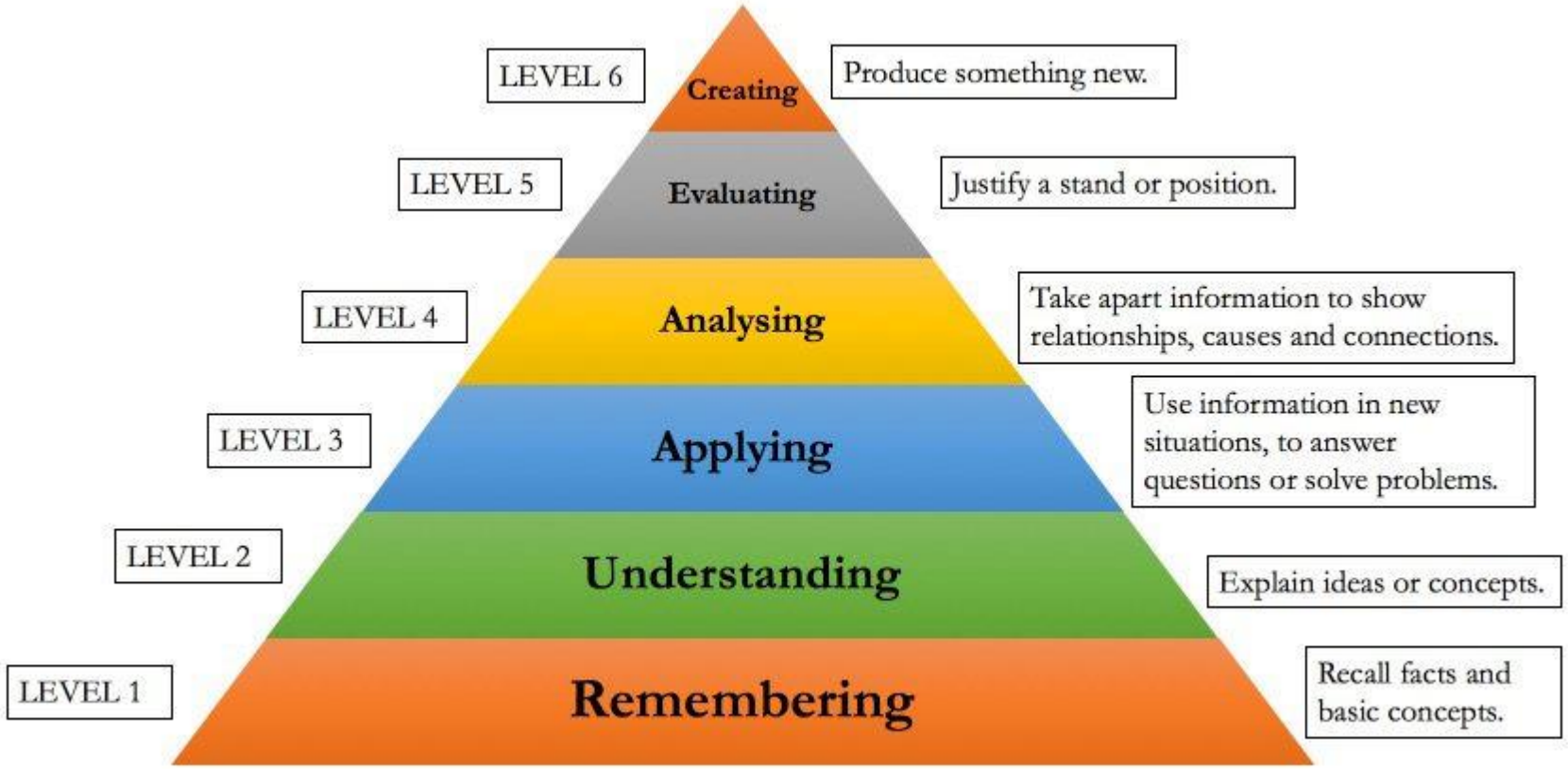
To inculcate the values of mutual respect and ethical practice of medicine



BLOOM'S TAXONOMY : DOMAINS OF LEARNING

Sr. #	Domain of learning	Abbreviation	Levels of the domain	Meaning
1	cognition	C	C1	Recall / Remembering
2			C2	Understanding
3			C3	Applying / Problem solving
4	Psychomotor	P	P1	Imitation / copying
5			P2	Manipulation / Follows instructions
6			P3	Precision / Can perform accurately
7	Attitude	A	A1	Receiving / Learning
8			A2	Respond / Starts responding to the learned attitude
9			A3	Valuing / starts behaving according to the learned attitude

BLOOM'S TAXONOMY OF THE COGNITIVE DOMAIN



Learning objectives

s.no	Learning objectives	Level of cognition
1	Recall physiological anatomy of three types of muscles	C1
2	Understand differences among three types of muscle	C2
3	Differentiate between histological features of three kind of muscles	C2
4	Describe difference in mechanisms of contraction of three types of muscles	C2
5	Enlist locations of three types of muscles.	C1

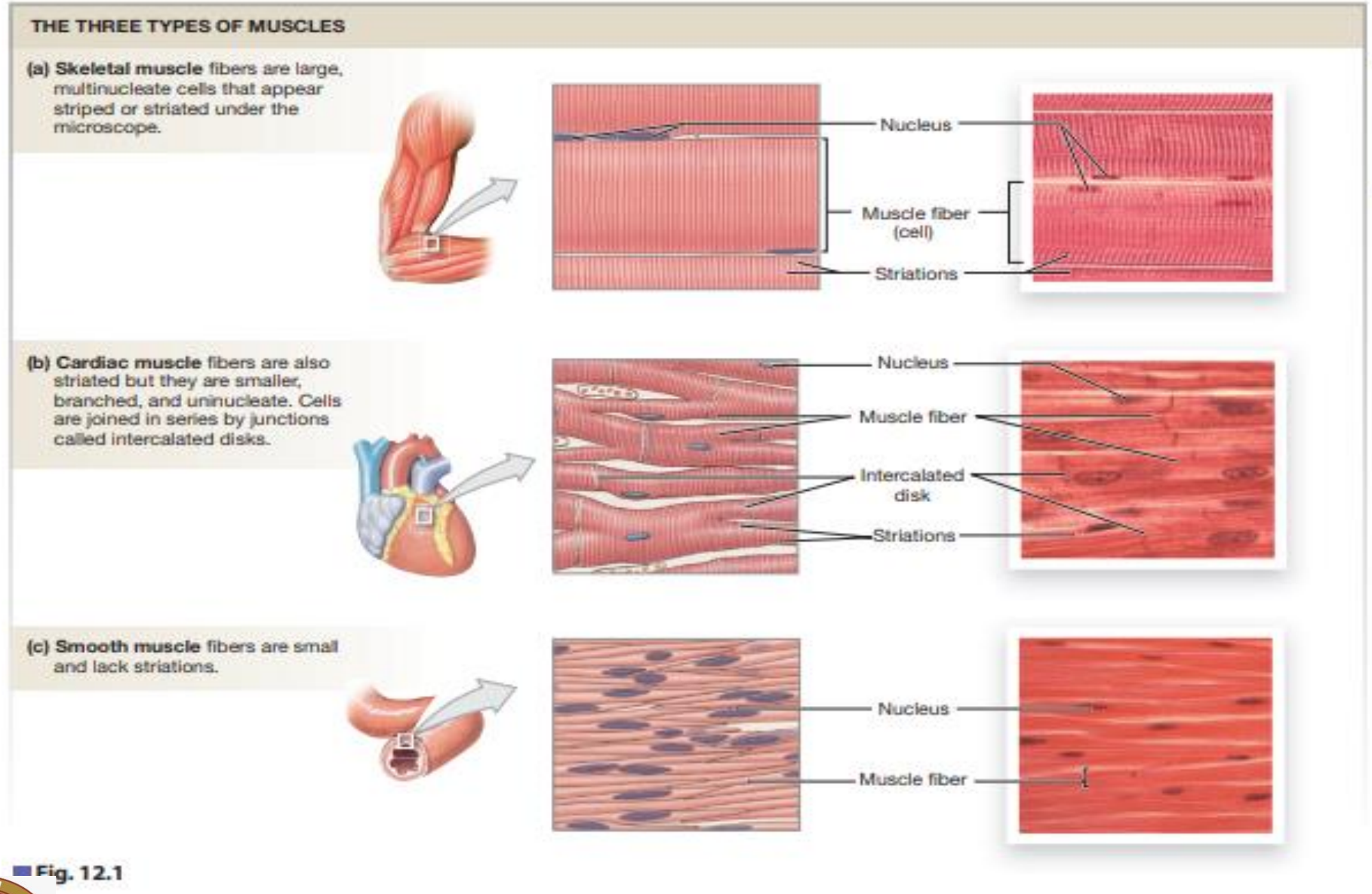


Fig. 12.1

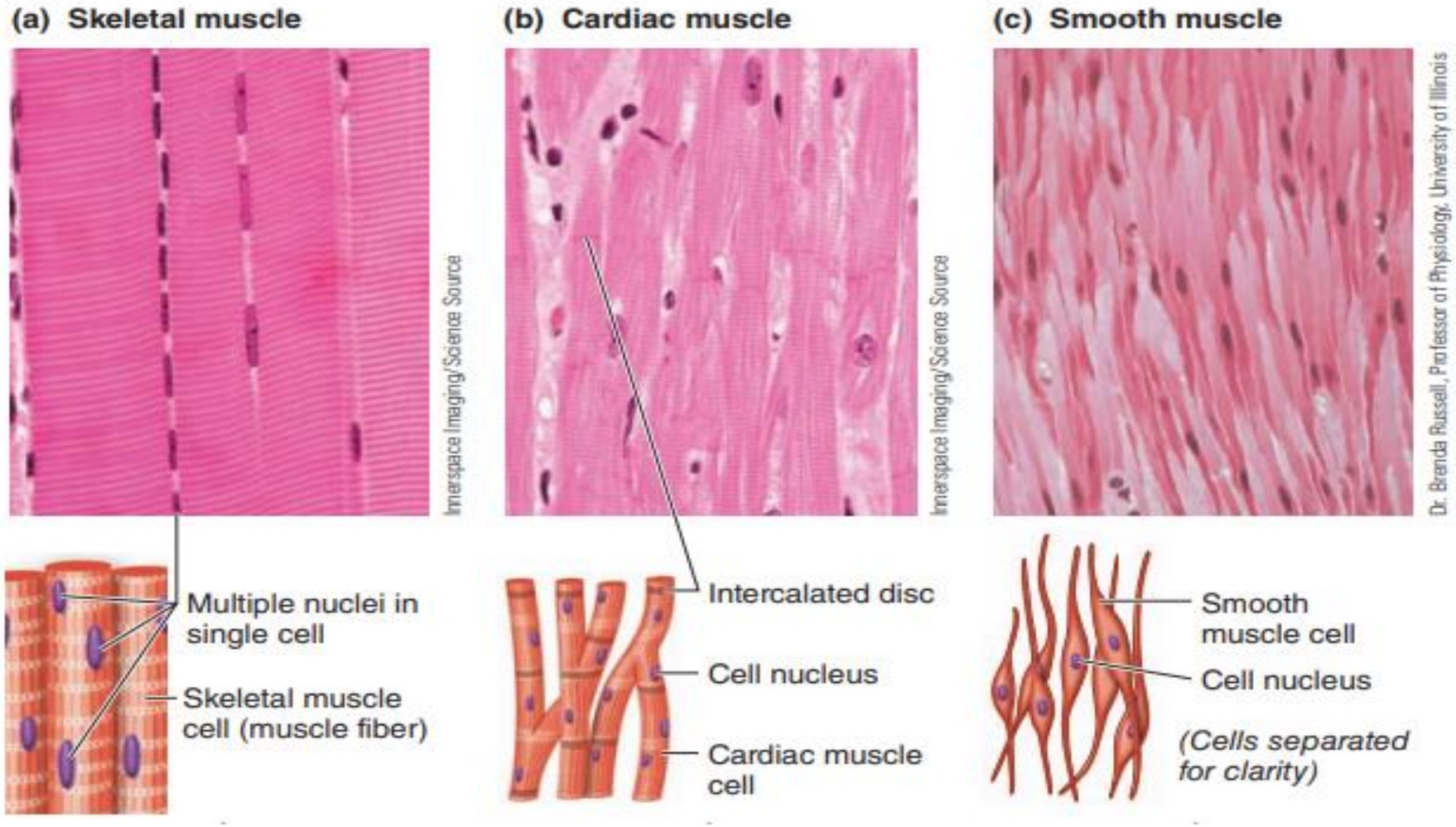
Horizontal Integration with Histology

Three Types of Muscles

Silverthorne physiology 6th edition

Horizontal Integration with Histology

Three Types of Muscles



Sherwood 9th edition page 252

Classification: Striated muscle, voluntary muscle	**Classification:** Striated muscle, involuntary muscle	**Classification:** Unstriated muscle, involuntary muscle
Description: Bundles of long, thick, cylindrical, striated, contractile, multinucleate cells that extend the length of the muscle	**Description:** Interlinked network of short, slender, cylindrical, striated, branched, contractile cells connected cell to cell by intercalated discs	**Description:** Loose network of short, slender, spindle-shaped, unstriated, contractile cells that are arranged in sheets
Typical location: Attached to bones of skeleton	**Location:** Wall of heart	**Typical location:** Walls of hollow organs and tubes, such as stomach and blood vessels
Function: Movement of body in relation to external environment	**Function:** Pumping of blood out of heart	**Function:** Movement of contents within hollow organs

Figure 8-1 Characteristics of three types of muscle. The photos in (a), (b), and (c) are light micrographs of longitudinal sections of skeletal, cardiac, and smooth muscle, respectively.

Sherwood 9th edition page 252

Comparison between the three types of muscle cells:

	Skeletal	Cardiac	Smooth
Location	Attached to bones	The heart	Internal organs and skin
Shape	Elongated and cylindrical 	Branched 	Spindle 
Nucleus	Several peripherally located nuclei	Single centrally located nucleus	Single centrally located nucleus
Striation	Striated	Striated	Non-striated
Function	• Movement of bone • Heat production	Beating of the heart	Movement of the viscera
Control	Voluntary	Involuntary	Involuntary

Three Types of Muscles

https://www.google.com/url?sa=i&url=https%3A%2F%2Fslideplayer.com%2Fslide%2F13670678%2F&psig=AOvVaw0gJ20Rcya8ut42e5PL-b9U&ust=1683743562645000&source=images&cd=vfe&ved=0CBEQjRxqFwoTCPC96Nnv6P4CFQAAAAAdAAAAABAE

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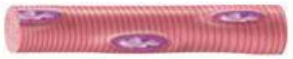
Three Types of Muscular Tissue

	Location	Function	Appearance	Control
Skeletal 	skeleton	movement, heat, posture	**striated**, multi-nucleated (eccentric), fibers parallel	**voluntary**
Cardiac 	heart	pump blood continuously	**striated**, one central nucleus	**involuntary**
Visceral (smooth muscle) 	G.I. tract, uterus, eye, blood vessels	Peristalsis, blood pressure, pupil size, erects hairs	**no striations**, one central nucleus	**involuntary**

Three Types of Muscles

Core Concept

Sarcopenia

- Sarcopenia is the age-related progressive loss of muscle mass and strength. The main symptom of the condition is muscle weakness. Sarcopenia is a type of muscle atrophy primarily caused by the natural aging process. Scientists believe being physically inactive and eating an unhealthy diet can contribute to the disease.

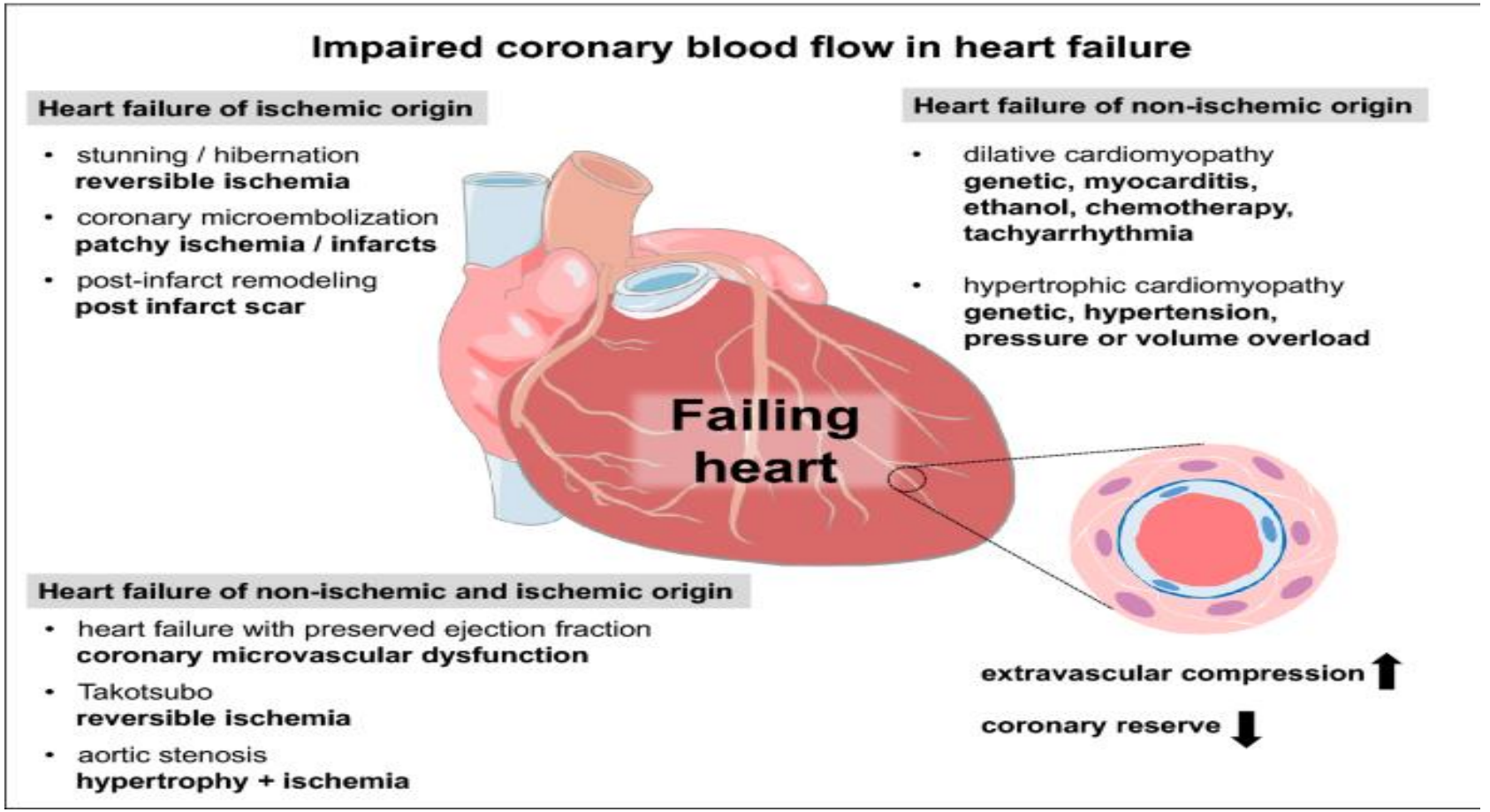
Vertical Integration with Internal Medicine

Rigor mortis

- Rigor mortis is a postmortem change resulting in the stiffening of the body muscles due to chemical changes in their myofibrils. Rigor mortis helps in estimating the time since death as well to ascertain if the body had been moved after death.

Vertical Integration with Forensic Medicine

Impaired Contractility and Heart Failure



Vertical Integration with Internal Medicine

Bioethics

- **Non-maleficence**

The principle of nonmaleficence holds that there is an obligation not to inflict harm on others. It is closely associated with the maxim primum non nocere (first do no harm).

Longitudinal bioethics Curriculum

Research

Journal of *Cardiovascular Development and Disease*

MDPI

Review

Novel Insights into the Sinoatrial Node in Single-Cell RNA Sequencing: From Developmental Biology to Physiological Function

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† These authors contributed equally to this work.

Abstract: Normal cardiac automaticity is dependent on the pacemaker cells of the sinoatrial node (SAN). Insufficient cardiac pacemaking leads to the development of sick sinus syndrome (SSS). Since currently available pharmaceutical drugs and implantable pacemakers are only partially effective in managing SSS, there is a critical need for developing targeted mechanism-based therapies to treat SSS. SAN-like pacemaker cells (SANLPCs) are difficult to regenerate in vivo or in vitro because the genes and signaling pathways that regulate SAN development and function have not been fully elucidated. The development of more effective treatments for SSS, including biological pacemakers, requires further understanding of these genes and signaling pathways. Compared with genetic models and bulk RNA sequencing, single-cell RNA sequencing (scRNA-seq) technology promises to advance our understanding of cellular phenotype heterogeneity and molecular regulation during SAN development. This review outlines the key transcriptional networks that control the structure, development, and function of the SAN, with particular attention to SAN markers and signaling pathways detected via scRNA-seq. This review offers insights into the process and transcriptional network of SAN morphogenesis at a single-cell level and discusses current challenges and potential future directions for generating SANLPCs for biological pacemakers.

Keywords: sinoatrial node; single-cell RNA sequencing; transcription factors; signaling pathways; molecular regulation

check for updates

Citation: Fan, W.; Yang, C.; Hou, X.; Wan, J.; Liao, B. Novel Insights into the Sinoatrial Node in Single-Cell RNA Sequencing: From Developmental Biology to Physiological Function. *J. Cardiovasc. Dev. Dis.* **2022**, *9*, 402. https://doi.org/10.3390/jcdd9110402

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Longitudinal Research Curriculum

https://doi.org/10.3390/jcdd9110402

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6. Journals and Researches will appear
7. You can find a Journal by clicking on JOURNALS AND DATABASE and enter a keyword to search for your desired journal.

References

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- Human Physiology by Dee Unglaub Silver thorn. 8TH Edition. Muscle (Chapter 12,Page 444)
- Guyton textbook of physiology
- Share wood textbook of physiology
- Ganong textbook of physiology
- **Research**
- https://doi.org/10.3390/jcdd9110402
- **Video link/youtube**
- **https://www.youtube.com/watch?v=loXOdSmP1tA**