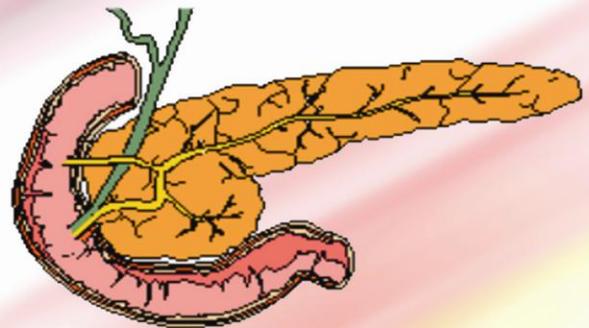
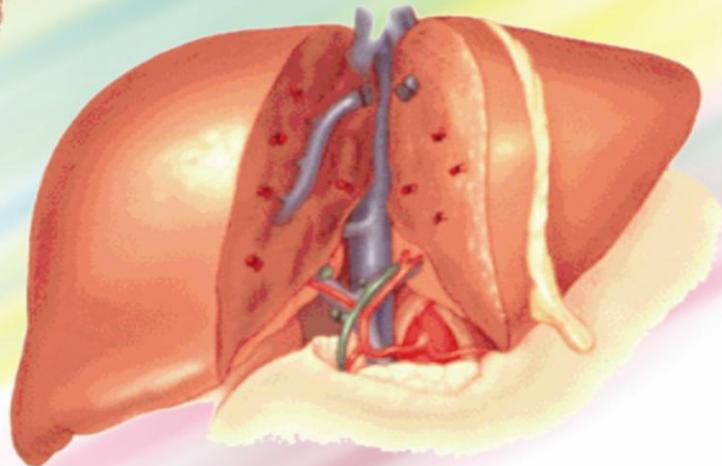


GASTRO INTESTINAL MODULE

PHASE I



FACULTY OF MEDICAL SCIENCES
UNIVERSITY OF SRI JAYAWARDENEPURA



Introduction

Welcome to the gastrointestinal module. The principle objective of the gastrointestinal module is to educate the student on the basic structure, physiological and biochemical aspects of the gastrointestinal system.

This module is designed emphasizing the essential components and minimizing the non-essential details. The students will get the opportunity of learning about different types of gastrointestinal secretions and their contribution to digestion and absorption. They will also learn about mechanisms of gut motility and important disorders of gut motility like vomiting.

The goals of the entire system is to convert ingestible food to absorbable particles and finally absorption. An important area of this module is to teach how gastrointestinal system is regulated, to achieve the above goals.

In this module student is exposed to learn common gastrointestinal diseases like diarrhoea, vomiting and jaundice. This exposure will help them to grasp the fundamentals of the gastrointestinal diseases and relate them to the clinical conditions in Phase II. For this purpose several case scenarios has been included at the beginning of each section.

Furthermore active learning is facilitated by small group discussions, fixed learning modules rather than didactic lectures.

Tutorials and small group discussions will enhance student's comprehension, evaluating capacity and reasoning ability. Seminars in jaundice, diarrhoea, vomiting will enhance student self-confidence, team effort, communicating skills and would be an important part of formative learning.

Students are given free time which allow them to engage in given academic activities as they wish. Activities that can be carried out in the language lab has been identified including listening activities, matching terms and definitions, cross words, puzzles, scenarios for role play and to develop communication skills. Skills lab activities that can be done in relation to gastrointestinal system are examination of the abdomen, insertion of NG tube and digital examination of the rectum in models.

For convenience and practicality the GI module is arranged in an anatomical manner starting from the mouth going down to the anus. The liver and the pancreas would be separate sections. In each section the main and the intermediate objectives would be laid down. The areas that the student should know as essential core knowledge would be designated as (A) and good to know and nice to know is depicted as (B) and (C) respectively.

We hope that at the end of the module the student could appreciate the importance of GI system as a vital part of the human body and understand how its functions relate to the functioning of the human body as a whole.

General objectives

- (1) To have a basic knowledge of the GI system and structure .
- (2) To have a basic knowledge of the function of the GI system
- (3) To understand how the structure of the GI tract is suited to carry out its function
- (4) To understand the basic anatomical, Biochemical and Physiological derangements of the GI tract that occurs in common diseases.
- (5) To understand how the GI tract function is regulated to coordinate to with functions of other organ systems of the body.

Main content areas

Introduction
Face & Mouth
Oesophagus
Abdominal wall
Abdominal cavity
Stomach
Duodenum
Small Intestine
Liver & Gall bladder
Pancreas
Large Intestine & rectum

Procedural skills

1. Insertion of an NG tube in a model
2. Examination of an abdomen
3. Digital examination of the rectum in a mode

Committee members

- Chairperson - Dr. P. Hettiarachchi - Physiology
- Convener - Dr. U. G. Chandrika - Biochemistry
- Members
- Dr. S. D. Jayaratne - Medicine
 - Dr. R. de Silva - Anatomy
 - Prof. M. T. M Jiffry - Physiology
 - Dr. R. Wickramasinghe - Parasitology
 - Dr. R. L. Satharasinghe - Medicine
 - Dr. A. Pathirana - Surgery
 - Dr. R. C. Fernandopulle - Gynaecology and Obstetric
 - Dr. C. Marasinghe - Physiology
 - Ms. U. P. K. Hettiarachchi - Biochemistry
- Demonstrators
- Ms. E. V. K. P Dharmasena
 - Dr. G. A. T. P. Premadasa
 - Dr. W.D.S.N. M. Liyanage
 - Dr. J. A. A. Priyantha

Real life situation 1-Vomiting

You and your close friends visited to Dansala on a vesak poya day and had lunch. When you came back to the boarding place, your friend had vomited repeatedly with a large amount of undigested food particles and he looked unwell. Then he had been taken to the dispensary. On the way you also had vomited 4-5 times. Doctor examined your friend and checked blood pressure and asked him to admit to CSTH. The doctor has examined you and he had asked to take some drugs and Jeevani.

Next day you noticed full recovery of you and went to hospital to see your friend. You saw that he has been given Saline drip. Jeevani also was present in his locker.

You are interested in finding,
What is the mechanism of development of Vomiting?
What are the causes of Vomiting?
What is the basis of giving Jeevani and Saline?

Real life situation 2 Portal Hypertension

While you were on vacation from university, your school friend called in the morning & told that his 56 year old uncle was admitted to the hospital following vomiting dark coloured blood. He also told that his uncle had a swollen abdomen & was bit confused at the time of admission.

Nimal told that his uncle was a heavy alcoholic, who had consumed a bottle of arrack per day for the last 25 years. He only stopped taking liquor 1 months back after he had being advised by the doctor following a similar episode of vomiting.

1. What do you think about Nimal's uncle's condition?

Real life situation 3 Jaundice

Your mother phoned you from your hometown telling that your aunt has been transferred to Kalubowila Hospital with abdominal discomfort. Your mother wants you to see your aunts in the evening on the way to your boarding place. She complained of abdominal discomfort and you noticed that she looked tired and yellow discoloration of her eyes. You were lucky enough to see the BHT since you are a medical student. You notice that doctor has ordered the following investigations.

Serum bilirubin

AST

ALT

Urobilinogen

You are interested in finding out,

What is the mechanism of development of jaundice in your Aunt?

Are there different types of Jaundice?

Why did the doctor order these investigations and how can they tell the reason for her illness?

RLS 4 for diarrhoea

Your friend in the boarding place developed diarrhea in the evening and you took her to hospital. Doctor admitted her to Ward 9 Colombo South Hospital. She was given a normal saline drip.

You are interested in finding the reasons of your friend's diarrhoea and reason for giving a saline. The following day when you were visiting your friend, she was feeling better. You want to find out the mechanism of development of diarrhea, the reason for giving a drip at the onset and ORS later.

Gastro intestinal system - Module

Intermediate objectives	Content	Activity	Duration	Dept
Introduction				
Students should be able to:				
Describe the regulation of the gastrointestinal system (A).	Gastrointestinal hormones Neural regulation Hormonal regulation	lecture FLM	1 hr 1hr	Phys Phys
Face & Mouth				
Students should be able to:				
Identify the structure of the mouth & its functions.	Vestibule, lips, cheeks, gum, teeth, mouth. Palate (roof) – hard palate, soft palate, muscles (Levator palate, tensor palate, palatoglossus, palatopharyngeus) Vessels and nerves. floor of the mouth. Boundaries Contents (submandibular gland, submandibular duct, sublingual gland, Lingual nerve, submandibular ganglion, hypoglossal nerve) Structures palpable in the bimanual examination of the mouth.	Lecture Prosected specimens	1 hr 3 hrs	Ana Ana

Gastro intestinal system - Module

Describe the structure of the tongue.	<ul style="list-style-type: none"> • Macroscopy & microscopy • Blood supply • Nerve supply • Lymph drainage. • Development. 	Lecture (Histo-1)	1hr	Ana
Describe the muscles of mastication & their innervation.	<ul style="list-style-type: none"> • Masseter, temporalis, lateral & medial pterygoid. 	Histology practical 1	3 hrs	Ana
Describe the temporo mandibular joint	<ul style="list-style-type: none"> • Articular surfaces • Capsules and ligaments, sphenomandibular ligament • Articular discs • Movements of the temporo mandibular joint. 	Lecture (Embryo-1.)	1hr	Ana
Describe the development of the face and palate.	<ul style="list-style-type: none"> • Development of face and palate and congenital abnormalities. 	Prosected specimens Cont...		Ana
		(during self study time)		Ana
		Lecture (Embryo.) Cont..		Ana

Gastro intestinal system - Module

Describe the structure of the pharyngeal wall A	<ul style="list-style-type: none"> • Muscles : external, internal • Nerves, arteries, veins, lymphatics • <u>Nasopharynx</u> (walls, choanae, features: nasopharyngeal tonsils, opening of auditory tubes, tubal tonsils, salpingopharyngeal fold, pharyngeal recess) • <u>Oropharynx</u>(walls, palatoglossal & palatopharyngeal arches, features: palatine tonsils, intratonsillar cleft) • <u>Laryngopharynx</u>(walls, inlet of larynx, features: medial & lateral epiglottic folds, epiglottic valleculae) piriform recess • Waldeyer's ring 	Prosected specimens SGD (Oral cavity, pharynx & salivary glands)	2hr 2hr	Ana Ana
Describe the development of pharyngeal arches & their derivatives	<ul style="list-style-type: none"> • Describe the development of gut derivatives from pharyngeal arches. B 	Lecture (Embryo-2.)	1 hr	Ana
Oesophagus				
Students should be able to:				
Describe the	<ul style="list-style-type: none"> • Development of the oesophagus. 	Lecture	1hr	Ana

Gastro intestinal system - Module

macroscopic & microscopic anatomy and relations of the oesophagus and development.	<ul style="list-style-type: none"> Gross anatomy of the oesophagus(A) (curvatures, constrictions, Relations, blood supply, venous drainage, lymphatic drainage, nerve supply.) Oesophagoscopy, barium swallow, oesophageal varices, Microscopy of the esophagus (B). 	Histology practical 1 Cont.....		Ana
Describe the phases of deglutition	<ul style="list-style-type: none"> Oral phase Pharyngeal phase Oesophageal phase (A) 	Lecture	1 hr	Phys
Describe the lower esophageal sphincter pressure and the competence of the lower oesophageal junction.	<ul style="list-style-type: none"> Abdominal oesophagus. (Gross anatomy) Factors that increase and decrease the lower oesophageal sphincter pressure (A). Factors contributing to the lower oesophageal competence (A). The factors that prevent gastroesophageal reflux (A). The structural basis for the gastro oesophageal sphincter (A). 	(Prosected specimens + Models) Cont..... Lecture	 1hr	Ana Phys
Define dysphagia and explain the pathophysiology of dysphagia	<ul style="list-style-type: none"> List the causes of dysphagia (A) Anatomical dysphagia <ul style="list-style-type: none"> ❖ structural lesion ❖ Physiological -Achalasia- cardia 	SGD	2 hrs	Phys
Abdominal wall				
Students should be able to:				
Describe the surface anatomy bones &	<ul style="list-style-type: none"> Anterior superior iliac spine and pubic tubercle. Surface markings of inguinal ligament, mid inguinal point & Mc 	Dissections AVP	3hr	Ana Ana

Gastro intestinal system - Module

landmarks of the abdomen.	<p>Burney' point.</p> <ul style="list-style-type: none"> • Lateral border of rectus abdominis • Dermatomes of anterior abdominal wall. <p>.....</p>	SGD Dissections	2hr 3hr	Ana Ana
Describe the planes & regions of the abdomen.(A).	<ul style="list-style-type: none"> • Planes (Subcostal, Inter tubercular etc...) • Regions (9 regions) • Trans pyloric plane • Describe the surgical incisions of the abdominal wall. 			
Describe the anterior abdominal wall (A).	<ul style="list-style-type: none"> • Layers (skin to parietal peritoneum) • Superficial fascia. (fatty layer, membranous layer) • Muscles • Rectus sheath : layers(ant & pos), contents, Linea alba • Fascia transversalis • Umbilicus : Ligaments : Ligamentum teres, medial umbilical ligament, median umbilical ligament. • Nerves : Lower 5 intercostal, subcostal, ilioinguinal, iliohypogastric. • Arteries : sup. & inf. Epigastric (anastomosis between subclavian & ext. iliac) , Others (Intercostals, branches of external iliac & femoral) • Veins : lateral thoracic, tributaries of great saphenous. (communication between sup. & inf. Vena cava) • Lymphatics : superficial (umbilicus as “watershed” area) • Different types of hernias (Incisional hernias, umbilical hernias...) 			
Describe the anatomical structure of the inguinal region.(A).	<ul style="list-style-type: none"> • Surface marking of superficial inguinal ring and deep inguinal ring. • Walls of inguinal canal. • Coverings and contents of spermatic cord. • Different types of hernias (direct and indirect...) 			

Gastro intestinal system - Module

Abdominal cavity				
Students should be able to:				
Identify the general structure of the abdominal cavity & arrangement of the abdominal viscera. (A)	<ul style="list-style-type: none"> • Map the surface markings of the liver, gall bladder, spleen, duodenum, pancreas, caecum, kidneys and abdominal aorta. • Peritoneum (parietal and visceral, folds of peritoneum : greater omentum, lesser omentum, mesentery,mesoappendix, Transverse mesocolon, sigmoid mesocolon,) • Functions of peritoneum. • Peritoneal cavity • Arrangement of abdominal viscera in 3 layers • Posterior abdominal wall. • Relevant clinical applications. 	Dissections Lecture (Peritoneal reflections) AVP	3 hrs 1 hr 1 hr	Ana Ana Ana
Stomach				
Student should be able to:				
Describe the macroscopic & microscopic anatomy of the stomach & development.	<ul style="list-style-type: none"> • Position, shape & size • External features, subdivisions. • Key relations. • Peritoneal attachments. • Mucosa • Blood supply, Nerve supply, Lymphatic drainage. • Microscopy. • Development 	Dissections Histology practical 1 Cont. Lecture (Histo) Cont...	2 hrs	Ana Ana Ana

Gastro intestinal system - Module

List the main functions of the stomach (A)	<ul style="list-style-type: none"> • Secretion • endocrine • Outline the consequences of gastrectomy (in relation to function of stomach) <ul style="list-style-type: none"> -early and late dumping syndrome • - megaloblastic Motor aneamia <ul style="list-style-type: none"> - Iron deficiency aneamia 	Lecture	1 hr	Phys
Demarcate the functionally distinct regions of the gastric mucosa (A). Describe the function of gastric mucosal cell (B).	<ul style="list-style-type: none"> • Functionally distinct regions of the gastric mucosa • Different cell types of the gastric mucosa and the functions 	Histology practical 1 Cont...		Ana
List the constituents of gastric juice and function (A). Describe the mechanism of secretion of HCl (A).	<ul style="list-style-type: none"> • Constituents of gastric juice <ul style="list-style-type: none"> -HCl -Pepsin -Intrinsic factor -Mucus <p>Cell type, the mechanism, regulation of gastric acid secretion, factors that affect gastric acid secretion</p>	Lecture	1 hr	Phys
Describe gastric mucosal barrier and its function and list the factors which disrupt the barrier (A).	<ul style="list-style-type: none"> • Factors that maintain the barrier and disrupt the barrier leading to peptic ulcer The role of <i>Helicobacter pylori</i> and Non steroidal anti inflammatory drugs in disrupting the barrier 	Lecture FLM	1 hr 1hr	Phys Phys

Gastro intestinal system - Module

	<ul style="list-style-type: none"> • Gastrinoma • Physiological basis of treatment. <ul style="list-style-type: none"> -Proton pump inhibitors -H2 inhibitors 	Tutorial	1hr	Phys
Describe gastric motility and emptying and its regulations (B).	<ul style="list-style-type: none"> • The events that occur following <ul style="list-style-type: none"> - entry of the food bolus into the stomach - receptive relaxation - peristalsis • The mechanism of gastric emptying. 	Lecture	1 hr	Phys

Gastro intestinal system - Module

<p>Define vomiting (A) List the causes, and explain the mechanism and consequences of vomiting(A)</p>	<ul style="list-style-type: none"> • The causes of vomiting, <ul style="list-style-type: none"> - Neural - Chemical - Psychic factors • The mechanism and consequences of vomiting • Fluid and electrolyte imbalance 	Seminar	3 hr	Phys
		RLS	1hr	Phy
Duodenum				
Students should be able to:				
Describe the macroscopic and microscopic anatomy of the duodenum.	<ul style="list-style-type: none"> • Describe the position, parts, key relations, peritoneal attachments (A) • Describe the mucosa, nerves and vessels. (A) • Microscopy (A) • Development (B) • Describe the relevant clinical applications. Duodenal ulcers, surgical interventions and complications, Radiology. (B) 	Dissections	3 hrs	Ana
		Lecture (Histo -2)	1hr	Ana
		Histology 2 practical	3 hrs	Ana

Gastro intestinal system - Module

Small Intestine				
Students should be able to:				
Describe the macroscopic & microscopic anatomy and development of the small intestine.	<ul style="list-style-type: none"> • Jejunum and ileum Duodenal jejunal flexure, mesentery, mucosal features, Meckel's diverticulum (B) • Vessels and nerves (A) • Microscopy (A) • Development (B) 	Histology practical 2 cont... Lecture (Embryo-3)	1hr	Ana Ana
List the main functions of the small intestine (A)	<ul style="list-style-type: none"> • Digestion of nutrients • Absorption of nutrients and water, minerals, electrolytes 	Lecture	1 hr	Phys
Describe the structure function relationship of the digestive epithelium and the circular muscles. (A)	<ul style="list-style-type: none"> • Structure of the digestive epithelium. <ul style="list-style-type: none"> ❖ Structure function relationship ❖ Constituents of intestinal juice ❖ Nerve supply. ❖ Types of intestinal motility and function. 	Histology practical 2 cont....		Ana
Describe principals of digestion of macromolecules	<ul style="list-style-type: none"> • Mechanism of digestion of protein, carbohydrate and fats(A) • Role of enzymes in protein, carbohydrate and fats digestion(B) 	Lecture SGD	1hr 2hrs	Bio Bio
Describe principals of absorption and transport of macromolecules	<ul style="list-style-type: none"> • Mechanism of absorption and transport of protein, carbohydrates and fat(A) 	Lecture	1 hr	Bio

Gastro intestinal system - Module

Describe the mechanism of absorption of micronutrients.	Water, iron, other minerals, vitamins (A).	Lecture	1 hr	Bio
Liver & Gall bladder				
Students should be able to:				
List the main functions of the liver and out line the consequences of derangement of liver function(A)	<ul style="list-style-type: none"> • Synthetic function-plasma protein, clotting factors, <ul style="list-style-type: none"> - Vit B12 - storage - detoxification - metabolism-carbohydrate, protein, lipid (will be done in endocrine and metabolism module) • State the fate of the constituents of the chylomicron in the hepatocyte, HDL, LDL formation and metabolism (A). 	Lecture	1hr	Phys
		Lecture	1hr	Bio
Describe the determinants of the liver function(A)	<ul style="list-style-type: none"> • Abnormalities of liver function test <ul style="list-style-type: none"> ➤ Protein-albumin, globulin ➤ Enzymes –AST, ALT, γ-Glutamyl ➤ Coagulation test- Prothombrine time 	RLS Lecture	1hr	Bio
		Practical	3 hr	Bio
Describe the macroscopic and microscopic anatomy of the liver and the biliary	<ul style="list-style-type: none"> • Liver – position & parts, fissures, surfaces and lobes, porta hepatic, common hepatic ducts, key relations of diaphragmatic and visceral surfaces, peritoneal attachments, bare area, vessels, physiological lobes) • Gall bladder – position & parts, key relations, cystic duct & artery 	Dissections SGD	3 hr 2hr	Ana Ana

Gastro intestinal system - Module

system.	<ul style="list-style-type: none"> variations, veins, lymphatics, nerves, gall stones) • Bile duct – origin, course, termination, sphincter) • Blood supply of the liver. 			
Structure function relationship of the hepatocytes(A)	<ul style="list-style-type: none"> • Explain the organization of liver tissue in relation to its microcirculation, making correct use of the terms portal triad, central vein, sinusoidal capillary, hepatocytes, lobule, periportal region and centrilobular region 	Histology Practical 2 Cont..		Ana
Schematic description of the relation ship between hepatocyte and bile canaliculi(A)	<ul style="list-style-type: none"> • Relationship of hepatocytes to bile canaliculi and sinusoidal capillaries 			
Describe the pathophysiological basis of portal hypertension(A)	<ul style="list-style-type: none"> • Collateral circulation of the liver and the mechanism of development of portal hypertension 	Lecture RLS	1 hr	Ana
Out line the embryological origin of the liver©	<ul style="list-style-type: none"> • Structural and functional changes in the liver between the embryonic period and the post natal period 	Lecture (Embryo-4)	1hr	Ana

Gastro intestinal system - Module

Describe the formation secretion and transport of bile(A) Outline the disorders of bile formation and secretion (A)	<ul style="list-style-type: none"> • Constituents of bile, formation of bile, Mechanism of secretion of bile in hepatocyte, transport and storage of bile in the duct system and gallbladder • Mechanism of gallstone formation, <ul style="list-style-type: none"> -super saturation of bile -excess bile pigments 	Lecture	1 hr	Bio
Physiological, biochemical, and anatomical basis of jaundice (A).	<ul style="list-style-type: none"> • Types of jaundice and mechanism of development of jaundice in liver disorders 	Seminar	2hr	Ana Bio Phys
		SGD	2hr	Bio Phys
		Hospital visit	3hr	Med Sur
Pancreas				
Students should be able to:				
List the functions of exocrine pancreas(A)				
Outline the regulation of pancreatic juice secretion(A)	<ul style="list-style-type: none"> • List the constituents of the pancreatic juice • Enzymes, HCO₃ • Pancreatic enzymes <ul style="list-style-type: none"> - tripsin, - chymotrypsin, - pancreatic amylase, - Lipase 	Lecture	1hrs	Phys

Gastro intestinal system - Module

	<ul style="list-style-type: none"> • Carbohydrate, protein, lipid digestion with pancreatic enzymes • CCK-PZ, secretin 			
Describe the macroscopic & (A) microscopic anatomy of the pancreas and its (A) development (B)	<ul style="list-style-type: none"> • Gross Anatomy of the pancreas and the main anatomical relation of the pancreases • Blood supply lymphatic drainage • Duct system of the pancreas • Pancreatic acinus. • Microscopy • Development 	Dissections	3hr	Ana
		Histology practical 2 Cont...		Ana
Large Intestine				
Student should be able to :				
Describe the gross anatomy of the large intestine, with relation to other structures & (A) Microscopic anatomy.	<ul style="list-style-type: none"> • Describe the anatomical structure of the caecum & vermiform appendix. (Position & variation, key relations, taenia coli, ileocaecal valve, meso appendix, vessels and nerves) • Relevant clinical applications. (Appendicitis, Thrombosis of appendicular artery, Appendicectomy) • Outline the gross anatomy of colon and its function. • (Parts, colic flexures, transverse mesocolon, haustra, appendices epiploicae, vessels, nerves) • Relevant clinical applications. • Microscopy. • Development 	Dissections	3 hrs	Ana
		Histology practical 2 Cont...		Ana
Describe the macroscopic & microscopic anatomy of the rectum & anal canal.	<ul style="list-style-type: none"> • Relations, peritoneal attachments, sphincters, mucosa. • Haemorrhoids, fistulas, anal fissures • Development 	Dissections cont... Lecture cont..		Ana Ana

Gastro intestinal system - Module

(A)	<ul style="list-style-type: none"> • Microscopy 	Histology practical cont...		
Describe the function of the large intestine (A). Describe the mechanism of defecation (A)	<ul style="list-style-type: none"> • Storage absorption, of water and electrolytes motility • Nerve supply of internal and external anal sphincters, • Physiological basis of colicky pain • Abnormalities of defecation -incontinence Neurological-Hirshprung disease 	Lecture SGD	1 hr 2hr	Phys Ana
Describe the physiological and biochemical basis of different types of diarrhoea (A).	<ul style="list-style-type: none"> • Secretory, osmotic, electrolyte abnormalities, beneficial effects of ORS. 	RLS Lecture Seminar SGD	1hr 2 hrs 2hrs	Phys Phys Phys Ana Phys
Overview				

Gastro intestinal system - Module

Student should be able to :				
Describe the blood supply and the lymph drainage of the GIT	• Blood supply of the GIT (A)	Lecture	1 hr	Ana
	• Lymph drainage of the GIT (A)	Lecture	1 hr	Ana

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6. Clinical Anatomy for medical students – Richard S. Snell
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