

Ministry of Healthcare of Ukraine  
Poltava State Medical University

**GUIDELINES  
FOR STUDENTS  
INDEPENDENT WORK  
IN THE PRACTICAL CLASSES PREPARING**

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*Academic discipline*

Internal medicine

*Module*

Current practice of internal medicine

*Content module*

Management of the patients with main symptoms and syndromes in cardiology clinic

*Study subject*

**Management of patients with edematous syndrome**

*Course*

VI

*Faculty*

of foreign students training

## **1. The aims of the training course:**

### **To Know:**

1. Definition and classification.
2. Etiological factors.
3. Classification.
4. Pathogenesis of lesions in organs and systems, their clinical manifestations.
5. Clinic and laboratory parameters.
6. Differential treatment at different stages.
7. Weather and performance.

### **To be able to:**

- Conduct surveys and examination of patients with edematous syndromes
- Know the basic invasive and noninvasive diagnostic techniques used in internal medicine, indications and contraindications for their conduct, possible complications
- identify major and atypical variants of the course and complications of edematous syndromes
- draft examination of patients with edematous syndromes
- Based on analysis of laboratory and instrumental examination to conduct differential diagnosis, justify and formulate diagnoses for diseases of cardiovascular, urinary and other systems
- prescribe treatment, determine prognosis, to conduct primary and secondary prevention
- diagnose and assist in edematous syndromes

### **The contents of topic:**

### **Text**

*Merck Manual Professional Version* <http://www.merckmanuals.com/professional>

**By Lyall A. J. Higginson, MD**

Edema is swelling of soft tissues due to increased interstitial fluid. The fluid is predominantly water, but protein and cell-rich fluid can accumulate if there is infection or lymphatic obstruction.

Edema may be generalized or local (eg, limited to a single extremity or part of an extremity). It sometimes appears abruptly; patients complain that an extremity suddenly swells. More often, edema develops insidiously, beginning with weight gain, puffy eyes at awakening in the morning, and tight shoes at the end of the day. Slowly developing edema may become massive before patients seek medical care.

Edema itself causes few symptoms other than occasionally a feeling of tightness or fullness; other symptoms are usually related to the underlying disorder. Patients with edema due to heart failure (a common cause) often have dyspnea during exertion, orthopnea, and paroxysmal nocturnal dyspnea. Patients with edema due to deep venous thrombosis (DVT) often have pain.

Edema due to extracellular fluid volume expansion is often dependent. Thus, in ambulatory patients, edema is in the feet and lower legs; patients requiring bed rest develop edema in the buttocks, genitals, and posterior thighs. Women who lie on only one side may develop edema in the dependent breast. Lymphatic obstruction causes edema distal to the site of obstruction.

### ***Pathophysiology***

Edema results from increased movement of fluid from the intravascular to the interstitial space or decreased movement of water from the interstitium into the capillaries or lymphatic vessels. The mechanism involves one or more of the following:

- Increased capillary hydrostatic pressure
- Decreased plasma oncotic pressure
- Increased capillary permeability
- Obstruction of the lymphatic system

As fluid shifts into the interstitial space, intravascular volume is depleted. Intravascular volume depletion activates the renin-angiotensin-aldosterone- vaspressin (ADH) system, resulting in renal Na retention. By increasing osmolality, renal Na retention triggers water retention by the kidneys and helps maintain plasma volume. Increased renal Na retention also may be a primary cause of fluid overload and hence edema. Excessive exogenous Na intake may also contribute.

Less often, edema results from decreased movement of fluid out of the interstitial space into the capillaries due to lack of adequate plasma oncotic pressure as in nephrotic syndrome, protein-losing enteropathy, or starvation.

Increased capillary permeability occurs in infections or as the result of toxin or inflammatory damage to the capillary walls.

The lymphatic system is responsible for removing protein and WBCs (along with some water) from the interstitium. Lymphatic obstruction allows these substances to accumulate in the interstitium.

### ***Etiology***

**Generalized edema** is most commonly caused by

- Heart failure
- Liver failure
- Kidney disorders (especially nephrotic syndrome)

**Localized edema** is most commonly caused by

- DVT or another venous disorder or venous obstruction (eg, by tumor)
- Infection
- Angioedema
- Lymphatic obstruction

Chronic venous insufficiency may involve one or both legs.

Common causes are listed by primary mechanism.

Common causes are listed by primary mechanism (see Table: [Some Causes of Edema](#)).

## Some Causes of Edema

Cause	Suggestive Findings	Diagnostic Approach <sup>a</sup>
Increased hydrostatic pressure, fluid overload		
Right heart failure (primary or secondary to left-sided disease)	Symmetric, dependent, painless, pitting edema, often with dyspnea during exertion, orthopnea, and paroxysmal nocturnal dyspnea	Chest x-ray and ECG
directly increasing venous pressure	Commonly, lung crackles, S <sub>3</sub> or S <sub>4</sub> gallop or both, and jugular venous distention, hepatojugular reflux, and Kussmaul sign	Usually echocardiography
Pregnancy and premenstrual state	Apparent by history	Clinical evaluation
Drugs (eg, minoxidil, NSAIDs, estrogens, fludrocortisone, dihydropyridine, diltiazem, other Ca channel blockers)	Symmetric, dependent, painless, usually mild pitting edema	Clinical evaluation
Iatrogenic (eg, excessive IV fluids)	Apparent by history and medical record	Clinical evaluation
Increased hydrostatic pressure, venous obstruction		
DVT	Acute, pitting edema in a single, usually lower extremity, usually with pain; sometimes Homans sign (pain in the calf when the foot is dorsiflexed)	Ultrasonography
	Redness, warmth, and tenderness; possibly less marked than in soft-tissue infection	
	Sometimes a predisposing factor (eg, recent surgery, trauma, immobilization, hormone replacement, cancer)	
Chronic venous insufficiency	Chronic edema in one or both lower extremities, with brownish discoloration, discomfort but not marked pain, and sometimes skin ulcers	Clinical evaluation
	Often associated with varicose veins	
Extrinsic venous compression (by tumor, a gravid uterus, or marked abdominal obesity)	Nonpainful, slowly developing edema	Clinical evaluation
	If tumor compresses the superior vena cava, usually facial plethora, distended neck veins, and absent venous pulse waves above the obstruction	Ultrasonography or CT if tumor is suspected
Prolonged absence of skeletal muscle pumping activity on extremity veins	Prolonged immobility (eg, being bedbound or on a long airline flight)	Clinical evaluation
	Painless, symmetric, dependent edema	

## ***Evaluation***

### **History**

**History of present illness** should include location and duration of edema and presence and degree of pain or discomfort. Female patients should be asked whether they are pregnant and whether edema seems related to menstrual periods. Having patients with chronic edema keep a log of weight gain or loss is valuable.

**Review of systems** should include symptoms of causative disorders, including dyspnea during exertion, orthopnea, and paroxysmal nocturnal dyspnea (heart failure); alcohol or hepatotoxin exposure, jaundice, and easy bruising (a liver disorder); malaise and anorexia (cancer or a liver or kidney disorder); and immobilization, extremity injury, or recent surgery (DVT).

**Past medical history** should include any disorders known to cause edema, including heart, liver, and kidney disorders and cancer (including any related surgery or radiation therapy). The history should also include predisposing conditions for these causes, including streptococcal infection, recent viral infection (eg, hepatitis), chronic alcohol abuse, and hypercoagulable disorders. Drug history should include specific questions about drugs known to cause edema. Patients are asked about the amount of Na used in cooking and at the table.

### **Physical examination**

The area of edema is identified and examined for extent, warmth, erythema, and tenderness; symmetry or lack of it is noted. Presence and degree of pitting (visible and palpable depressions caused by pressure from the examiner's fingers on the edematous area, which displaces the interstitial fluid) are noted.

In the general examination, the skin is inspected for jaundice, bruising, and spider angiomas (suggesting a liver disorder).

Lungs are examined for dullness to percussion, reduced or exaggerated breath sounds, crackles, rhonchi, and pleural friction rub.

The internal jugular vein height, waveform, and reflux are noted.

The heart is palpated for thrills, thrust, parasternal lift, and asynchronous abnormal systolic bulge. Auscultation for loud pulmonic component of 2nd heart sound (P<sub>2</sub>), 3rd (S<sub>3</sub>) or 4th (S<sub>4</sub>) heart sounds, murmurs, and pericardial rub or knock is done; all suggest cardiac origin.

The abdomen is inspected, palpated, and percussed for ascites, hepatomegaly, and splenomegaly to check for a liver disorder or heart failure. The kidneys are palpated, and the bladder is percussed. An abnormal abdominal mass, if present, should be palpated.

## **Red flags**

Certain findings raise suspicion of a more serious etiology of edema:

- Sudden onset
- Significant pain
- Shortness of breath
- History of a heart disorder or an abnormal cardiac examination
- Hemoptysis, dyspnea, or pleural friction rub
- Hepatomegaly, jaundice, ascites, splenomegaly, or hematemesis
- Unilateral leg swelling with tenderness

## **Interpretation of findings**

Potential acute life threats, which typically manifest with sudden onset of focal edema, must be identified. Such a presentation suggests acute DVT, soft-tissue infection, or angioedema. Acute DVT may lead to pulmonary embolism (PE), which can be fatal. Soft-tissue infections range from minor to life threatening, depending on the infecting organism and the patient's health. Acute angioedema sometimes progresses to involve the airway, with serious consequences.

Dyspnea may occur with edema due to heart failure, DVT if PE has occurred, acute respiratory distress syndrome, or angioedema that involves the airways.

Generalized, slowly developing edema suggests a chronic heart, kidney, or liver disorder. Although these disorders can also be life threatening, complications tend to take much longer to develop.

These factors and other clinical features help suggest the cause.

## **Testing**

For most patients with generalized edema, testing should include CBC, serum electrolytes, BUN, creatinine, liver function tests, serum protein, and urinalysis (particularly noting the presence of protein and microscopic hematuria). Other tests should be done based on the suspected cause, brain natriuretic peptide (BNP) for suspected heart failure or D-dimer for suspected PE.

Patients with isolated lower-extremity swelling should usually have venous obstruction excluded by ultrasonography.

## ***Treatment***

Specific causes are treated.

Patients with Na retention often benefit from restriction of dietary Na. Patients with heart failure should eliminate salt in cooking and at the table and avoid prepared foods with added salt. Patients with advanced cirrhosis or nephrotic syndrome often require more severe Na restriction ( $\leq 1$  g/day). K salts are often substituted for Na salts to make Na restriction tolerable; however, care should be taken, especially in patients receiving K-sparing diuretics, ACE inhibitors, or angiotensin receptor blockers and in those with a kidney disorder because potentially fatal hyperkalemia can result.

People with conditions involving Na retention may also benefit from loop or thiazide diuretics. However, diuretics should not be given only to improve the appearance caused by edema. When diuretics are used, K wasting can be dangerous in some patients; K-sparing diuretics (eg, amiloride, triamterene, spironolactone, eplerenone) inhibit Na reabsorption in the distal nephron and collecting duct. When used alone, they modestly increase Na excretion. Both triamterene and amiloride have been combined with a thiazide to prevent K wasting. An ACE inhibitor–thiazide combination also reduces K wasting.

### ***Geriatrics Essentials***

In the elderly, use of drugs that treat causes of edema requires special caution, such as the following:

- Starting doses low and evaluating patients thoroughly when the dose is changed
- Monitoring for orthostatic hypotension if diuretics, ACE inhibitors, angiotensin receptor blockers, or  $\beta$ -blockers are used
- Evaluating for bradycardia or heart block if digoxin, rate-limiting Ca channel blockers, or  $\beta$ -blockers are used
- Frequently testing for hypokalemia or hyperkalemia
- Not stopping Ca channel blockers because of pedal edema, which is benign

Logging daily weight helps in monitoring clinical improvement or deterioration immensely.

### ***Key Points***

- Edema may result from a generalized or local process.
- Main causes of generalized edema are chronic heart, liver, and kidney disorders.
- Sudden onset should trigger prompt evaluation.
- Edema may occur anywhere in the body, including the brain.
- Not all edema is harmful; consequences depend mainly on the cause.

*Last full review/revision August 2014 by Lyall A. J. Higginson, MD*

### **Self preparation at class:**

Listen information;

Work with patients (with cardiac pathology);



Ask about the problems that have not been found in information given.

**Self preparation at home:**

Compose the plan of your answer;

Answer the questions to the topic;

Do the test given above.

**Questions**

1. A patient who suffers from heart failure has enlarged liver, edemata of lower extremities, ascites. What is the leading mechanism in the development of this edema?

- A Hydrodynamic
- B Colloid osmotic
- C Lymphogenous
- D Membranogenic
- E Mix

2. A patient with chronic cardiac insufficiency have edema of lower extremities. What is the leading link of their pathogenesis?

- A. Hypothalamo-hypophysis system
- B. Renin-angiotensin-aldosterone system
- C. Sympato-adrenal system
- D. Parasympathetic system
- E. Kalikrein-kinin system

3. Strong decreased value of albumins and oncotic pressure of blood plasma takes place in a patient. What will be the result of it?

- A. Increase of blood volume
- B. Decrease of diuresis
- C. Edemas
- D. The ESR decrease
- E. Increase of blood viscosity

### 5.3. The final stage.

The teacher should assess the current practical activity of each student during the lesson by conducting standardized final control by solving situational problems. The analysis of the success of each student announced evaluation of each student magazine and exhibited in the volume of visits and their achievement. Group leader simultaneously captures evaluations of success roll volume and visits classes students, teachers certify them with his signature.

The teacher briefly inform students about the topic of the next lesson and instructional technique prepare for it.

### 6.1. Tests for the determining of basis knowledge

Testing material are added

### 6.2. Theoretical questions:

1. Aetiology and pathogenesis of edematous syndrome.
2. Clinical symptoms and main clinical syndromes of edematous syndrome;
3. Modern classification of edematous syndrome;
4. Methods of diagnostics of edematous syndrome;
5. Methods of treatment of edematous syndrome.

## 7. *Recommended literature*:

### I. Main:

1. Internal Medicine: in 2 books. Book 1. Diseases of the Cardiovascular and Respiratory Systems: textbook / N.M. Seredyuk, I.P. Vakaliuk, R.I. Yatsyshyn et al. Київ, Медицина., 2019. - 664 + 48 кольор. вкл.).
2. Internal medicine: Part 1 (cardiology, rheumatology, haematology): textbook for English-speaking students of higher medical schools / edited by Professor M.A. Stanislavchuk and Professor V.A. Serkova. - Vinnytsia: Nova Knyha, 2019. - 392 p.
3. Медицина за Девідсоном: принципи і практика / Навчальний посібник: пер. 23-го англ. вид.: у 3 т. Т.3 С. Ралстона, Я. Пенмана, М. Стрекена, Р. Гобсона; К.: ВСВ «Медицина», 2021. – 642 с.
4. CURRENT Medical Diagnosis and Treatment 2012, Fifty-First Edition (LANGE CURRENT Series) by Stephen McPhee, Maxine Papadakis and Michael W. Rabow (Paperback - Sep 12, 2011)/
5. Побічна дія ліків – Side Effects of Medications: навчальний посібник 2 т. / заг. ред. В.М. Бобирьова, М.М. Потяженка. – Вінниця:
6. Cardiovascular diseases. Classification, standards of diagnosis and treatment / Edited by Academician Kovalenko V.M., Prof. Lutaia M.I., Prof. Sirenko Yu.M., Prof. Sychova O.S. – Kyiv. – 2020.
7. Perederii V.H., Tkach S.M. Principles of internal medicine. – Vol.2 / Textbook for students of higher educational institutions. – Vinnytsia: Nova knyha. – 2018.
8. Internal diseases. The textbook based on the principles of evidentiary medicine, 2018.

### II. Additional literature:

1. Recommendations of the Association of Cardiologists of Ukraine for the diagnosis and treatment of chronic heart failure / Voronkov L.H. – moderator, working group of the Ukrainian Association of Heart Failure Specialists. – 2017.
2. Respiratory diseases / Ghanei M. - In Tech, 2012. - 242 p.
3. Clinical respiratory medicine / Spiro S., Silvestri G., Agusti A. - Saunders, 2012. - 1000 p.
4. Principles and practice of interventional pulmonology / Ernst A., Herth F. -Springer, 2012. - 757 p.
5. Clinical respiratory medicine / Spiro S., Silvestri G., Agusti A. - Saunders, 2012. - 1000 p.
6. Petrov Y. The chief symptoms and syndromes in patients with cardiovascular pathology : The practical handbook for medical students / Ye. Petrov, Yu. Goldenberg, N. Chekalina; UMSA. - Poltava : TexcepBic, 2010. - 143 .
7. Gastroenterology and Hepatology Board Review: Pearls of Wisdom, Third Edition (Pearls of Wisdom Medicine) by John K. DiBaise (May 11, 2012)
8. Clinical Pulmonology 2012 (The Clinical Medicine Series) by M.D., C. G. Weber (Oct 30, 2011) - Kindle eBook
9. Clinical Nephrology 2012 (The Clinical Medicine Series) by M.D., C. G. Weber (Sep 19, 2011) - Kindle eBook

10. Clinical Nephrology 2012 (The Clinical Medicine Series) by M.D., C. G. Weber (Sep 19, 2011) - Kindle eBook
11. Hematology: Clinical Principles and Applications, 4e by Bernadette F. Rodak MS MLS (Feb 18, 2017)
12. Rheumatology, 2-Volume Set: EXPERT CONSULT - ENHANCED ONLINE FEATURES AND PRINT, 5e by Marc C. Hochberg MD MPH, Alan J. Silman MD, Josef S. Smolen MD and Michael E. Weinblatt MD (Oct 19, 2019)
13. Endocrine Pathology: Differential Diagnosis and Molecular Advances by Ricardo V. Lloyd (Nov 5, 2018)
14. Clinical Endocrinology 2012 (The Clinical Medicine Series) by M.D., C. G. Weber (Sep 19, 2017) - Kindle eBook
15. Williams Textbook of Endocrinology: Expert Consult-Online and Print, 12e by Shlomo Melmed, Kenneth S. Polonsky MD, P. Reed MD Larsen and Henry M. Kronenberg MD (May 27, 2016)
16. Electrocardiography, 3e with Student CD (Booth, Electrocardiography for Health Care Personnel) by Kathryn A. Booth (Jan 27, 2017)
17. Echocardiography Review Guide: Companion to the Textbook of Clinical Echocardiography: Expert Consult: Online and Print, 2e (Expert Consult Title: Online + Print) by Catherine M. Otto (Mar 7, 2017).

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