身體診查 (Physical Examination)

-徵候之擷取及解讀

(Acquisition and interpretation of signs)

台灣 台中

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Outlines

Introduction (概論)

Physical Examination (理學檢查)

A) Basic/general assessments (基本一般評估 - 5B)

B) Multi-systems, screening exam

(多系統、篩檢性、簡便理學檢查)

~~C) Individual system examination (系統各論)~~

(To be omitted)

D) Problem-oriented focused exam – e.g. dyspnea

(問題導向-重點性理學檢查)

-)

臨床醫學教育

1) Knowledge（知識）*
2) Clinical Skills（技能）
   - Acquisition skill（擷取技能）
     - History/physical exam*
     - Reasoning skill*
     - Decision making skill*
     - Communication skill*
     - Procedures skills
3) Attitudes (態度、行為)
   - 人文素養*、醫學倫理*、醫病關係等*
   - 醫學法律*、醫療經濟、實證醫學、醫療品質、醫學資訊
4) Value

擷取技能

問診、理學檢查*

配套*

Physical Examination

Essential clinical acquisition skill, in problems solving/diagnosis

Based on 5 senses to define in human body

1) Structural (anatomic/pathologic) status; and
2) Functional (physiologic) status

Normal or abnormal ?

• Visual	Inspection
• Auditory	Auscultation*
	Percussion
• Tactile	Palpation
• Olfactory	Smell (odors)
• Gustatory	Taste

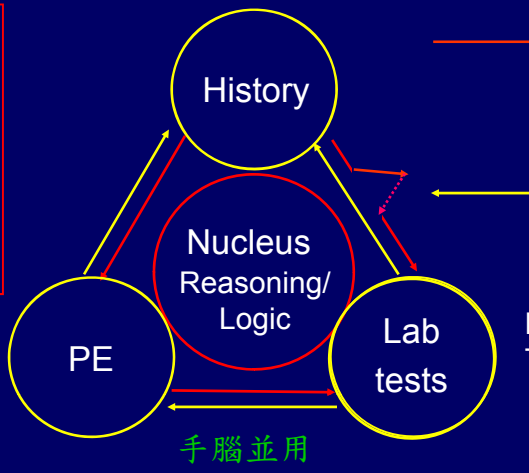
Uniqueness of CV system
inspection, palpation and auscultation,
can be, and should be performed simultaneously
(3 in 1 Exam)

*Auscultation, the last modality, except in exam of abdomen

Problems Solving/Clinical Diagnosis

臨床診斷
Problem solving
Means (trio):
1) 病史 (History)
2) 理學檢查 (PE)
3) 實驗室檢查 (Lab tests)

理學檢查
始於第一接觸
(PE begins with 1st encounter)



In the trained, history and PE are conducted simultaneously

避免偏見、自我考驗、
避免被詐

Logical Interpretation of Acquisition Data

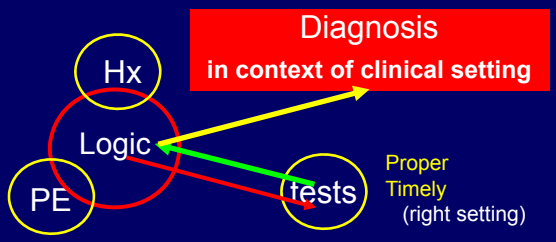
Daily Dialogue
Speech content

Clinical setting
Symptom (history, Hx)

Facial expression
Body language

Signs (PE findings)

臨床醫學生活化
察言– 問診
觀色 – 理學檢查
(擷取及解讀)



Hx/PE – anytime, anywhere and priceless!!

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Physical Examination (理學檢查) – 4 Classes

A) Basic/general assessments（基本一般評估 - 5B)

B) Multi-systems, screening examination

(多系統、篩檢性、簡便理學檢查)

C) Individual system examination (系統各論)

D) Problem-oriented focused exam（問題導向、重點性檢查）

A) Basic/general Assessments – 5B, a must

1) Complete PE → C) systems → students
B) Screening
D) Problem-oriented → Residents
B) Screening
D) Problem-oriented → D) Problem-oriented (Staffs, with reliable assistants)

2) 健康檢查 → B) Screening
D) Problem-oriented

3) 緊急急迫性 → D) Problem-oriented exam

A + B Exam

A) Basic/general assessments
（基本一般評估 - 5B)

Plus

B) Multi-systems, screening examinations
（多系統篩檢性簡便檢查）

Initial Examination – (A + B Exams)

A) 5-item Basic Assessments

1. General appearance
2. Mental status
3. Vital signs
   - Body temperature
   - Blood pressure
   - Pulse*
   - Respiration*
4. Peripheral perfusion status
5. Oxygenation status

Sitting

15 seconds

*Quantity/Quality (質、量 並重)

B) Multi-system screening

- Integument
- HEENT**
- Respiratory
- CV
- ~~Gstrointestinal~~
- ~~Genitourinary~~
- Metabolic/endocrine
- Hematology
- Musculoskeletal
- Neuropsychiatry

**head, eyes, ears, nose and throat

Initial Examination – (A + B Exams)

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**head, eyes, ears, nose and throat

Physical Examination

A. 5-item Basic Assessments (基本五大項)

1. General appearance (整體外表)
2. Mental status (意識狀態)
3. Vital signs (生命徵象)
   - Body temperature (體溫)
   - Blood pressure (血壓)
   - Pulse (脈搏)
   - Respiration (呼吸)

Quantity/Quality (質、量 並重)

4. Peripheral perfusion status (灌流狀態) - extremities temp
5. Oxygenation status (氧合狀態) - cyanosis ?

A -1. 一般外表 (General Appearance)

1) General health status
   Appears healthy; In no distress;
   Acutely ill (specify; e.g. dyspeic); Chronically ill
2) Physique and nutrition status
   Well developed and nourished;
   Obese; thin; cachectic (惡病質)
3) Affection and emotional status:
   Tense; anxious; depressed; apathetic etc.
4) 疾病診斷 (On-spot diagnosis)

5) 其他: 個性、社經、教育、職業、族群背景 (參考用)

1) General Appearance – Example

Acromegaly

Cushing

Xanthelasma

Central cyanosis
Congenital methemoglobinemia

SLE

Hypothyroidism

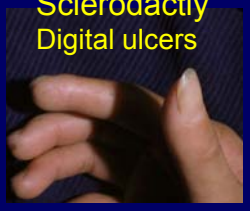
Neurofibromatosis type 1
Pheochromocytoma

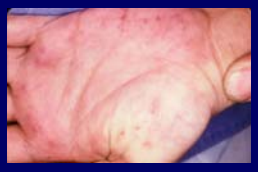
A + B Exam - Example - 1

Palm xanthoma

Needle track
Drug addict

Sclerodactly
Digital ulcers





Janeway

Osler

Aborigine
trait

Peutz-Jeghsers
syndrome

A + B Exam - Example 2

Raynaud
Systemic sclerosis

Trachea Thyroid

Traumatic
Splinter hemorrhage

Hand tremor
Occupation
Cigarette stain
老菸槍戒菸 when?

Acromegaly

SBE
*

Non-cyanotic Clubbing

Cyanosis

Spoon nail

First-visit Examinations – Sitting vs. Supine

Position, dictated by clinical setting and patient status

Sitting Position

OPD patients;
Ward patients,
relatively stable

Supine Position

Ward patients, Unstable
ER patients

A. 5-item Basic Assessment

1. General appearance
2. Mental status
3. Vital signs
   - Body temperature
   - Blood pressure
   - Pulse
   - Respiration
4. Peripheral perfusion status
5. Oxygenation status

B) Multi-system screening – Example 2

Popliteal

Dorsalis pedis

Posterior tibialis

Peripheral Pulses
Leg edema veins

xanthoma

Osler-Weber-Rendu

Raynaud

Femoral-neck fracture

Cholesterol embolism

Aborigine trait

Physical Examination

A. 5-item Basic Assessments (基本五大項)

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2. Mental status (意識狀態)
3. Vital signs (生命徵象)
   - Body temperature (體溫)
   - Blood pressure (血壓)
   - Pulse (脈搏)
   - Respiration (呼吸)

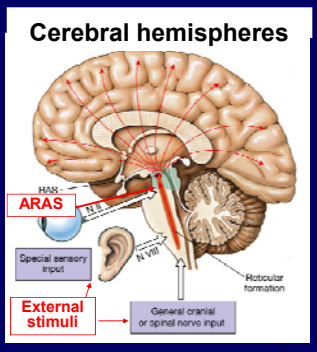
   Quantity/Quality (質、量 並重)
4. Peripheral perfusion status (灌流狀態) - extremities temp
5. Oxygenation status (氧合狀態) - cyanosis ?

2. 意識狀態 (Mental Status)

意識狀態描述 (description of metal status):

QQOPERA

(意識狀態描述): alert; well oriented; irritable; agitated; drowsy; somnolent; confused; stupor; obtunded; comatose



Pearson education Inc. 2003

意識 (consciousness) 形成兩要件

1) 基本意識 - 清醒 (arousal)

腦幹 (brainstem) *ARAS專司清醒和睡眠

2) High意識 - 認知 (awareness)

大腦兩半球 (hemispheres) 主司認知能力

意識障礙 pathophysiology: organic or functional dysfunction

Organic: brainstem (small lesion); cerebral hemispheres (diffuse)

Functional: brain stem (diffuse); cerebral hemisphere (diffuse)

基本的腦幹arousal喪失, 造成大腦無法認知 (腦死)

基本的腦幹arousal清醒, 大腦 diffuse dysfunction 無認知 (植物人)

*ARAS = ascending reticular activating system)

意識障礙 (Consciousness Disturbance)
Systems Approach (系統類別法)

問題之分析 (analysis): Q QOPERA

(意識狀態描述): Alert/well oriented; irritable; agitated; drowsy; somnolent; confused; stupor; obtunded; semi-comatous; comatous

解決方法 - Systems approach

1) 中樞神經精神系統 (Neuropschiatry)
   器質性病變(感染、腦瘤) 或精神性疾病
2) 心血管系統 (Cardiovascular)
   血管性腦病變、低血壓、 休克 (shock)
3) 內分泌/新陳代謝系統 (metabolic encephalopathy
   Ph changes; low pO_2, high pCO_2; hyper-, or hypo-osmolarity
   Osmolarity = $2Na^+$ + glucose/18 + BUN/2.8 + α (≥ 0)
   電解值不平衡：高鈉或低鈉血症 (Na^+), 高鈣或低鈣血症 (Ca^{++})
   糖尿病 (DM): 低血糖症 (hypoglycemia); HHS; ketoacidosis
   甲狀腺功能低下 (myxoedematous coma)
   Endogenous/exogenous chemicals: 肝，腎衰竭 (尿毒症);
   藥物 (drug)、酒精 (alcohol)、CO

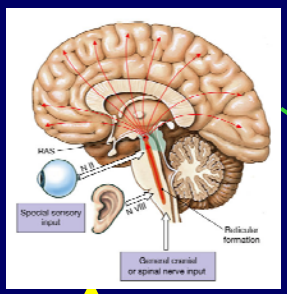
α > 0
mannitol, contra st media
ethanol
methanol etc

汽、機車引擎
Analog - Engine malfunction
1) Mechanical
2) Gasoline shortage (quantity)
3) Changes in gasoline quality

Problem Solving

Sequential Approaches
意識障礙 (Consciousness Disturbance)

Cerebral hemispheres



問題分析: QQOPERA 法

1) Neuro-psychiatry
2) CV system
3) Endocrine/ metabolic

解決方法

Patho-pysiology

Or

Systems

External stimuli 外界訊息

Pathologic

Lesion

Anatomic

Patho-pysiology

5B-3

3. 生命徵象(Vital Signs)

1) 體溫(Body temperature)
2) 脈搏(Pulse)
3) 血壓(Blood pressure)
4) 呼吸(Respiration)

脈搏及呼吸需包括 量 與 質

1) 體溫 (Body Temperature)

Elevated Body temperature

1) Fever
   Set point elevation in hypothalamus
2) Hyperthermia
   Heat dissipation < Production* or acquisition**
   *Endogenous – Hhyperthyroidism
   **Exogenous – heat stroke, fire

台灣霹靂火

1) Infectious (inflammatory)
2) Non-infectious (inflammatory)
3) Neoplasm
   Benign
   Malignant
~~4) Circulatory~~
5) Metabolic/endocrine
6) Hematologic
~~7) Degeneration~~
8) Physical/chemical* injury

*** Always consider inclusion of drugs**

Blood Pressure (血壓)

Non-invasive, indirect assessment of aortic pressure

Assumptions:

1) Reliable sphygmomanometer
2) Correct technique
3) No obstruction between aorta and arm
4) Adequate minimal blood flow –
   no extreme arterial vasoconstriction

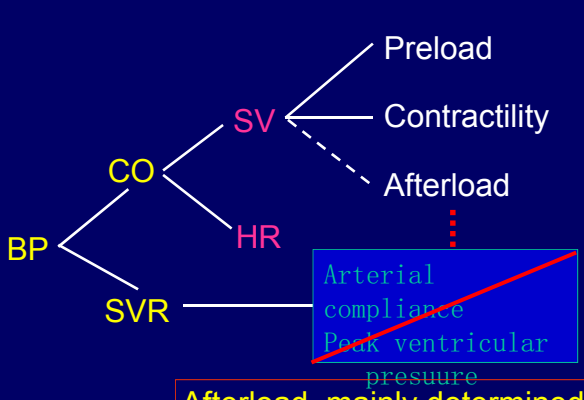
Parameters:

Direct: 1) Systolic pressure
2) Diastolic pressure

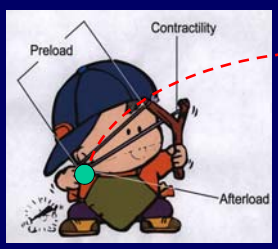
Indirect: 3) Pulse pressure (PP)
= (systolic – diastolic pressure)

*Normal range = 30 – 50 mmHg

BP = f (SVR, HR, preload, afterload, contractility)



Hung's "Slingshot Cardiac Physiology"



Afterload, mainly determined by SVR

Thus, In practicality,

BP = f (SVR, HR, preload, ~~afterload,~~ contractility)

unless presence of significant LV outflow resistance

Mechanism of Hypotension in Shock

	HR	Preload	Contractility	PVR
1) Hypovolemic		↓		
2) Obstructive		↓		
3) Cardiogenic			↓	
4) Distributive				
a) Anaphylactic		↓		↓
b) Neurogenic	↓	↓		↓
c) Septic		↓	N → ↓	↓ → ↑

Pulse (脈搏)

Quantity: rate/min; physiologic rate = 'normal' rate

Quality:

- Rhythm
  - Regular
  - Irregular: regularly irregular; irregularly irregular
- Amplitude
  - Uniform amplitude:
    - Normal, decreased (weak, thready),
    - bounding (蹦跳脈)
  - Varying amplitudes
    - pulsus alternans (交替脈)
      - (Markedly depressed ventricular function)
    - Paradoxical pulse (奇異脈)
      - (Cardiac tamponade etc.)

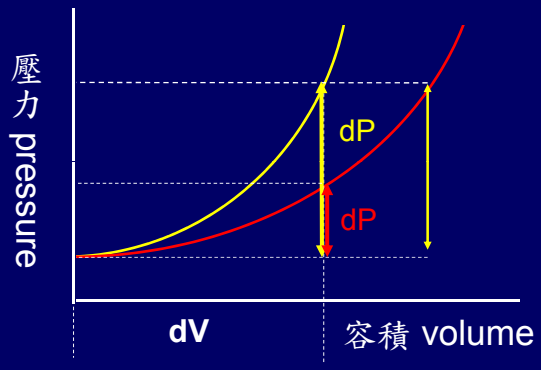
順應性 (Compliance)

順應性 (C) 規範容積 (V) 壓力 (P) 間關係

$C = dV/dP$

[dV =容積變化; dP = 壓力變化]

順應性
簡單的可視為
擴張難易度
(dispensability)



Pulse Pressure = f (stroke volume, arterial compliance)

C = dV/dP; dP = dV/C; dP = PP; dV = PP

PP = SV/C

脈壓 (pulse pressure, PP)
取決於心動容積 (stroke volume, SV) 與動脈順應性 (compliance, C)

動脈如果無阻塞或無嚴重收縮 – 脈壓反映脈搏大小

Pulse pressure	Pulse	PP = SV/C
30 – 50 mmHg	normal	normal SV and C
	*"normal (pseudo)"	↓ SV; ↓ C
< 30 mmHg	weak	↓ SV;
> 50 mmHg	bounding	normal SV; ↓ C
		↑ SV; normal C

*Beware of pitfall

Bounding Pulse

$PP = \frac{SV}{C}$

1) Increased Left ventricular (LV) SV
   - High output status (LV SV = effective SV)
     - Physiologic – exercise, anxiety, pregnancy
     - Pathologic – fever, hyperthyroidism, severe anemia Paget
   - Run-off to low-resistance system (LVSV > effective SV)
     - 1) LV (severe AR) ;
     - 2) Right heart (rupture sinus of Valsalva);
     - 3) PA (PDA, AP window);
     - 4) Systemi vein (AV shunts)
2) Decrease artrerial compliance
   - Aherosclerosis (aged); coarctation of aorta

Anatomy of Respiratory System

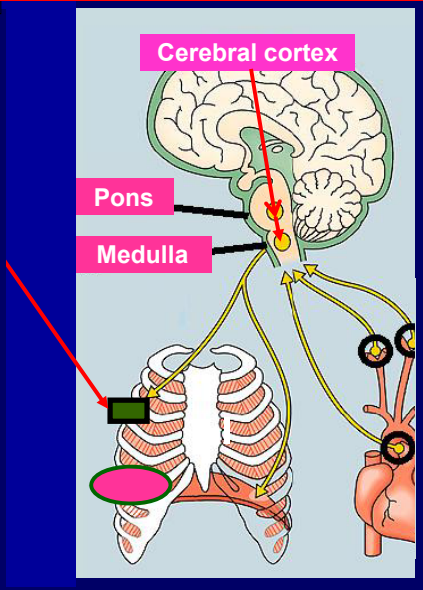
Ventilation

Central control system
- Respiratory centers
- Cerebral cortex

Nerves (wires)

Neuromuscular junction (socket)

Respiratory apparatus (hardwares)
- Thorax (胸廓)
- Pleural cavity
- Lungs parenchyma
- Airways



Perfusion

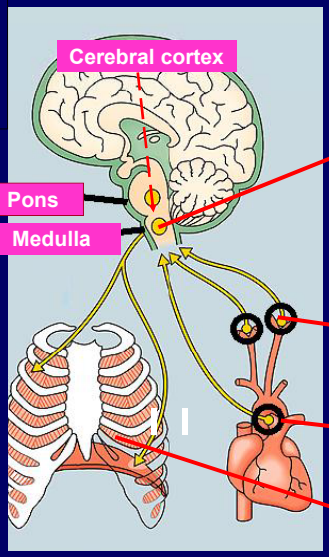
Vessels (pulmonary and bronchial arteries)

Central Regulation of Breathing (rate, depth and rhythm)

Respiratory Centers
(Control rate, depth/rhythm)

Pons
- upper pons –
  - pneumotaxic center
  - inhibits inspiration/ control rate
- lower pons –
  - apneustic center

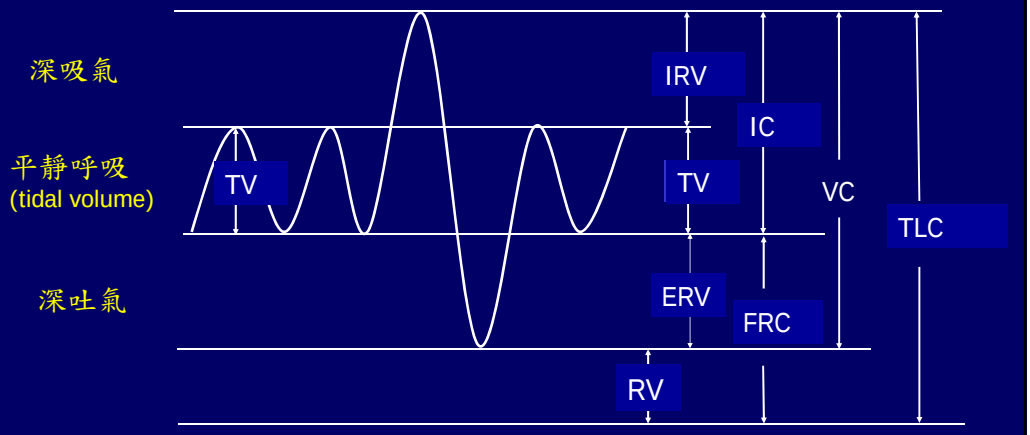
Medulla – rhythm control
(Cerebral cortex)



Feedback systems

Chemical sensors
- **Central (medulla)**
  - H^+ sensor
- **Peripheral**
  - Chemoreceptors
    - Carotid body – pO2/pCO2 sensors
    - Aortic body – pO2 sensor
  - Stretch receptor
    - Thorax

Physical Examination and Lung Volumes



Minute ventilation = tidal volume x respiratory rate/min

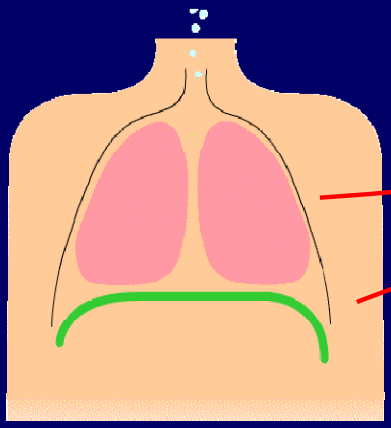
ERV: expiratory reserve volume; FRC: functional residual capacity;
IC: inspiratory capacity; IRV: inspiratory reserve volume; RV: residual voulme;
TLC: total lung capacity; TV: tidal volume; VC: vital capacity;

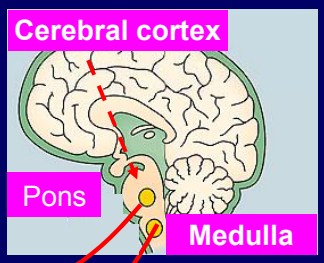
Observation of Breathing

Not only *rate (quantity)*

but also *patterns (quality)*

（量、質並重）



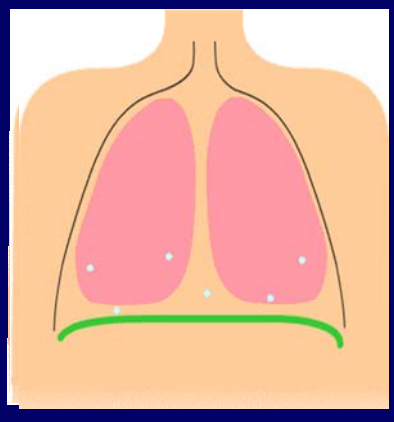


Rate/depth

Rhythm

Wikimedia 2008

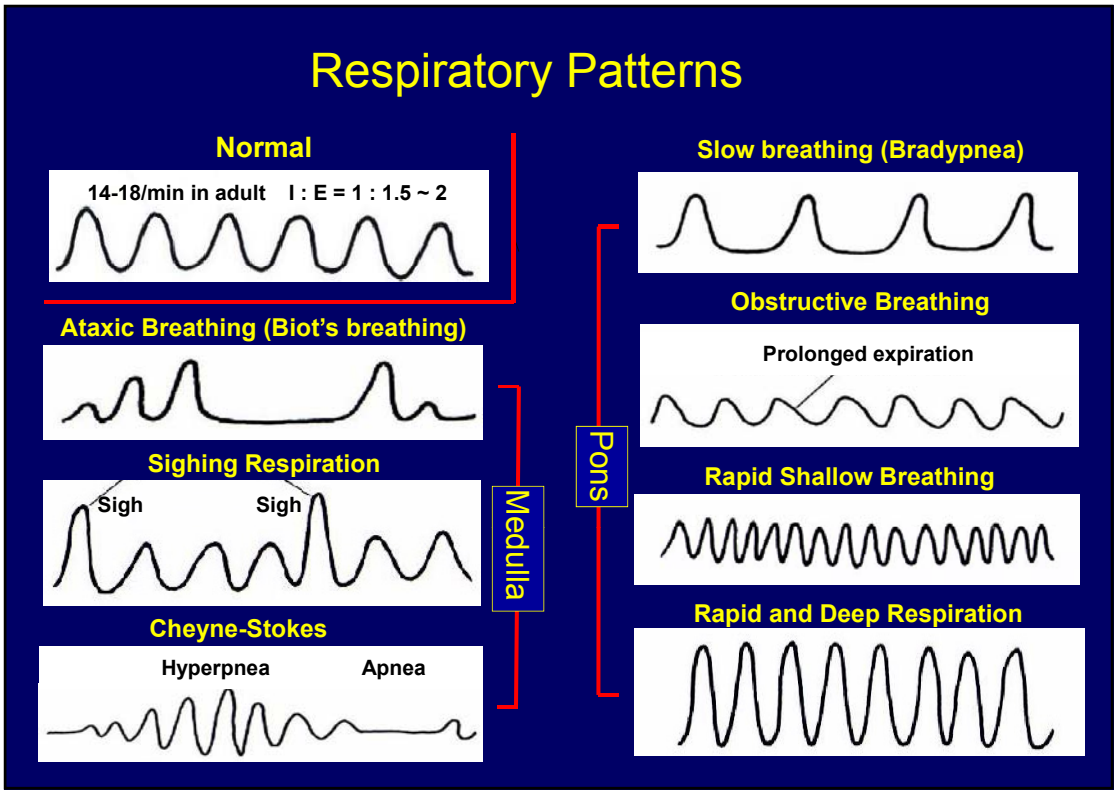
Assessment of Inspiratory Capacity (IC)



Tidal breathing

Forced inspiration

End-expiration

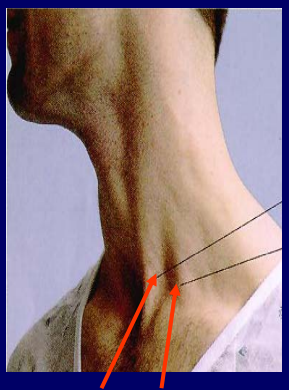


Respiration

Quantity: rate/min (normal, tachypnea, bradypnea)
physiological rate

Quality:

Abnormal sounds: stridor, wheezing
Respiration pattern: shallow, deep
Kussmaul, Cheyne-Stokes,
ataxic, sighing, obstructive,
paradoxical breathing
Chest expansion:
normal; diminished; symmetrical etc.
Retraction: supraclavicular; intercostal
Use of accessory muscles



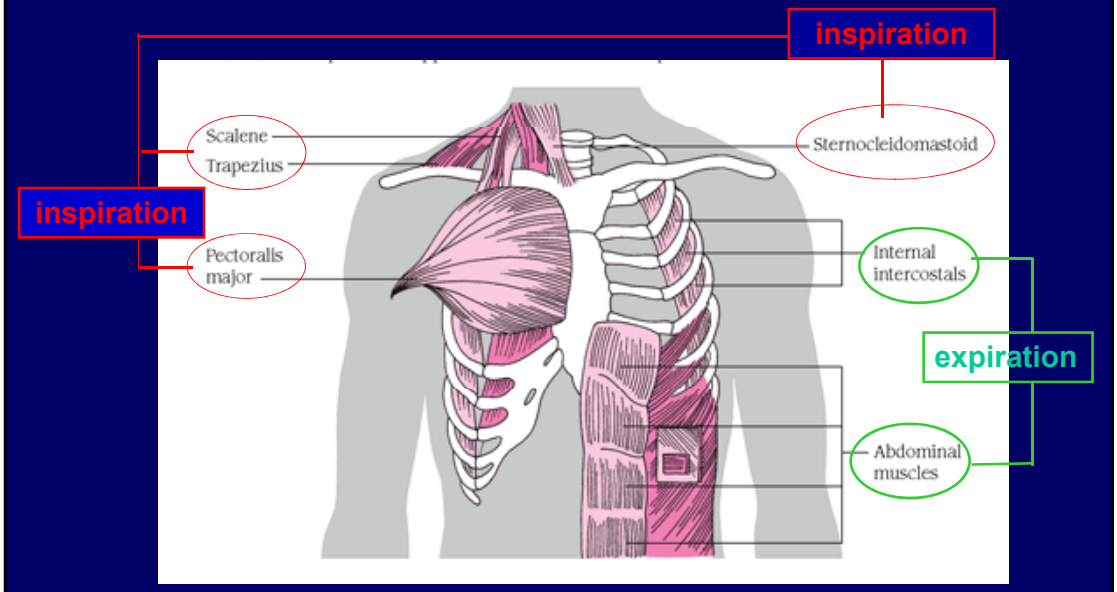
Sternocleidomastoid muscles

Respiratory Pattern

	Normal Respiration	Paradoxical Respiration*
Chest	Inspiration / Expiration	Inspiration / Expiration
Abdomen	Inspiration / Expiration	Inspiration / Expiration

*Diaphragm paralysis

Respiratory Accessory Muscles



Professional Guide to Signs & Symptoms (Fifth Edition)

A-4. Peripheral Perfusion Status (*灌流狀態)

觀察各手、腳之溫度(cool, cold or warm)以便判斷
1) 動脈阻塞之有無, 及 2) 動脈收縮之程度(作評估末梢動脈阻力- SVR 之參考)

寺廟糧食分配 – *觀察小僧糧食分配

大僧	Brain, heart
中僧	Vicerae (including kidneys)
小僧	Skin, *extremities, skeletal muscles

寺廟糧食 – Cardiac output

A-4. Peripheral Perfusion Status (灌流狀態)

觀察各手、腳之溫度(cool, cold or warm)以便判斷
1) 動脈阻塞之有無, 及2) 動脈收縮之程度(作評估末梢動脈阻力SVR之參考)

Warm extremities (adequate or excessive flow)
- Normal SVR
- Decreased SVR
  - Appropriate – high output state
  - Inappropriate – warm shock; arterial vasodilator missuse

Cool/cold extremities (decreased flow – increased resistance)

Functional resistance	Organic resistance
Increased SVR	Vascular obstruction
Normal SVR*	(usually asymmetry)

*Regional factors – e.g. exposure in cold environment;
Warm, not necessarily “good”; cool/cold, not necessarily “bad”

寺廟糧食分配

氧合狀態異常 – 發紺(Cyanosis)

靜脈與毛細管內有過量青紫色物質而導致皮膚與黏膜呈青紫色

導致發紺的血中青紫色物質:

1) Unsaturated hemoglobin

2) Methemoglobin (Fe^{+++})

3) Sulfhemoglobin

以最常見 unsaturated hemoglobin 為例，毛細管血中 unsaturated hemoglobin > 5 gm/dl 則出現 cyanosis

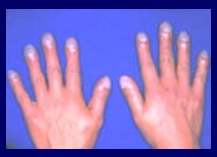
發紺分類

1. 中心性發紺 (Central cyanosis)

質變 – 血質不好(其單位體積之含氧量不夠)

動脈血 pO_2下降 (SpO_2下降)，但流量夠

(手腳不冰冷)



2. 末稍性發紺 (Peripheral cyanosis)

量變 – 血流量下降(手腳冰冷)

但血質好(單位體積之含氧量夠);動脈血pO_2正常

發生機轉：

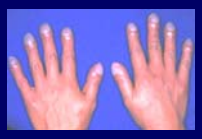
1) 機能性血管收縮（正常生理反應或病態反應）

例如緊張、天冷、sympathetic tone上升

2) 器質性血管阻塞，例如：動脈或靜脈阻塞

3. 混合型發紺 (Mixed type) 以上兩者合併出現

Central Cyanosis



A. Reduced arterial pO2
   Increased reduced hemoglobin
   > 5 gm/dl

動脈血 pO_2下降(hypoxemia)機轉
1) hypoxic hypoxemia (↓FiO_2);
2) alveolar hypoventilation;
3) V/Q mismatch;
4) diffusion defect;
5) anatomic right-to-left shunt

B. Normal arterial pO_2
   1) Methemoglobin (Fe^{+++})

   2) Sulfhemoglobin

Congenital methemoglobinemia

Cyanotic lip Warm limbs

B) Individual System Examination

(系統個論)

Omitted

D) Problem-oriented examination

(問題導向-重點性理學檢查)

1) Systems Approach (系統類別法)

Example - 呼吸困難 (Dyspnea)

問題之分析
QQOPERA
問題解決
系統類別法

5 systems

~~1. Integument (IT)~~
~~2. HEENT (HT)~~
3. Respiratory
4. Cardiovascular
~~5. Gastrointestinal (GI)~~
~~6. Genitourinary (GU)~~
7. Metabolic/endocrine
8. Hematologic
~~9. Musculoskeletal (MS)~~
10. Neuropsychiatry

Example - PE in Dyspnea

5 Basics

+

5 Systems

1. Respiratory system
   (呼吸系統)
2. Cardiovascular system
   (心血管系統)
3. Endocrine/metabolic system
   (新陳代謝/內分泌系統)
4. Hematologic system
   (血液系統)
5. Neuropsychiatric system
   (神經精神系統)

Eyes
Neck (trachea, thyroid, jugular veins)
Chest/lungs
Heart
Abdomen (distension)
Legs (edema, veins)