Importance of “make sense” from S/S

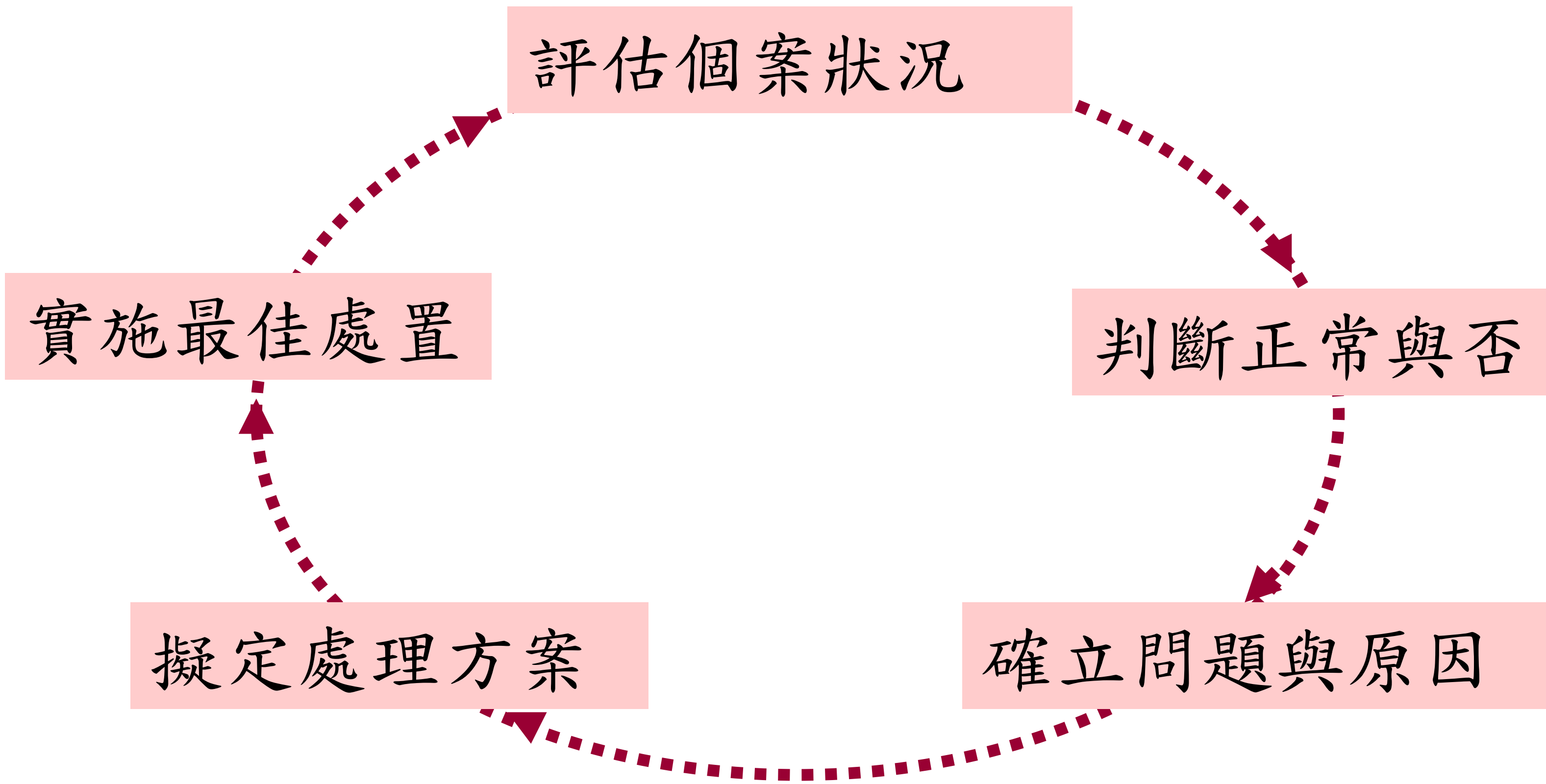
臨床數據判讀與護理意涵課程引言

邱艷芬教授

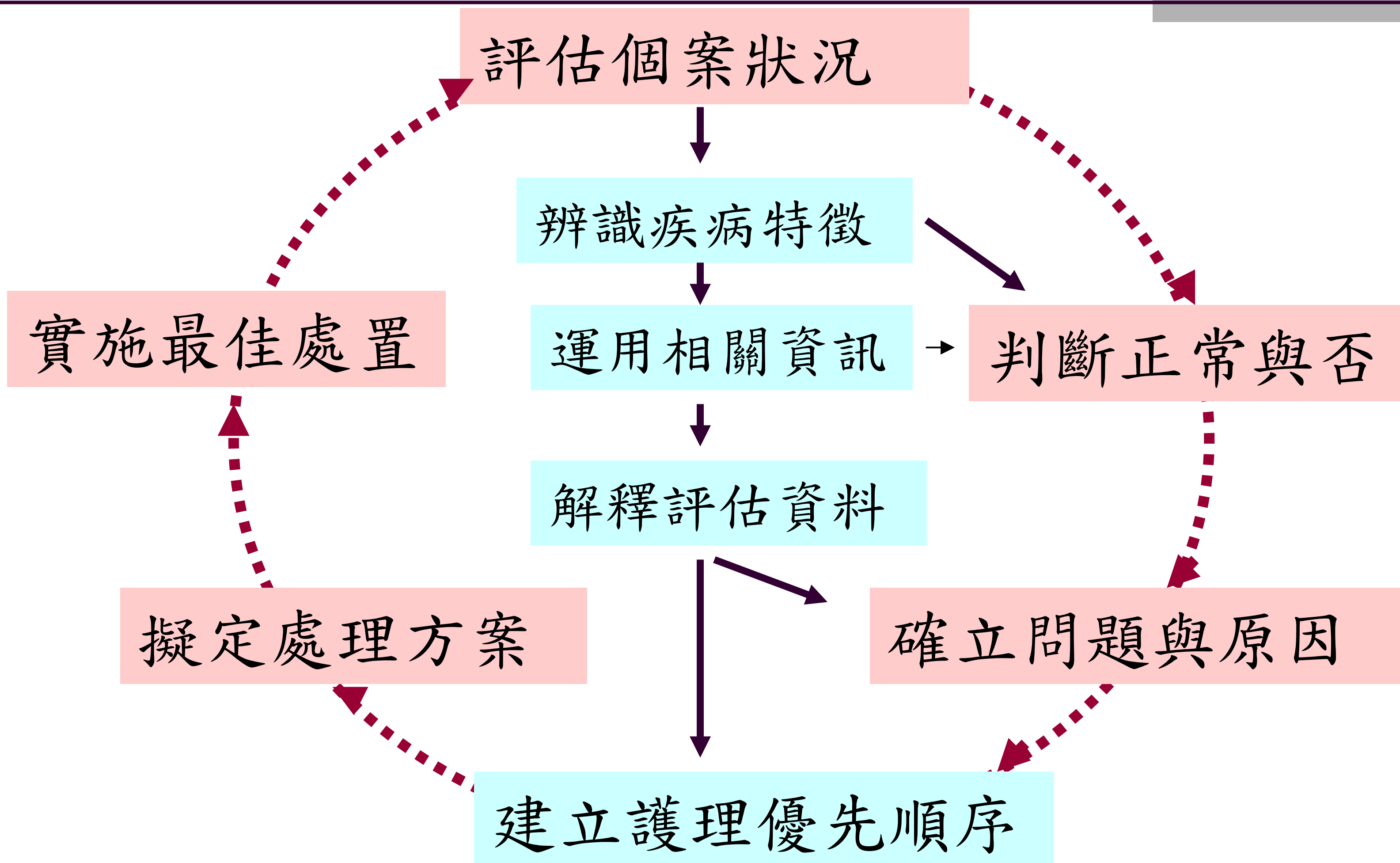
專業護理的實踐

- 護理的過程必須是理性的
- 護理的過程必須是批判性思考
- 護理的過程必須以實證為本

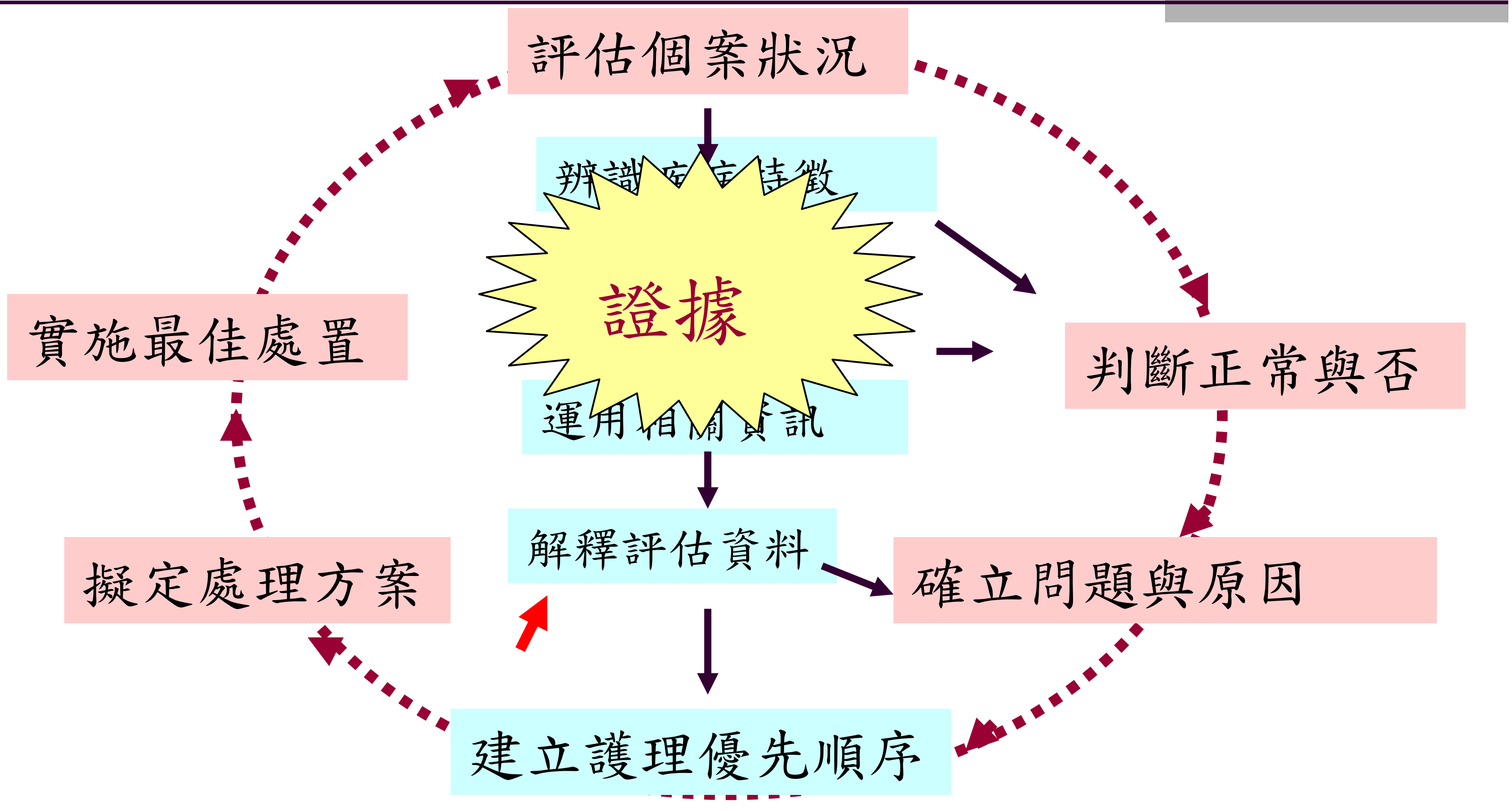
護理的過程必須是理性的



護理的過程必須是批判性思考



護理的過程必須以實證為本



證據來源：病人表現、文獻、理論

解讀數據的能力

- 連接evidence to
  - 確立問題
  - 確立原因
  - 決定處理問題之先後順序

護理問題的確認

- ☑ 異於正常 — 與正常標準相比
- ☑ 影響功能 — 學理上data的臨床意義
- ☑ 造成不適 — 評估個案的感受
- ☑ 威脅生命 — 學理上問題的嚴重性

severity

- 決定定問題處理的先後次序

實證護理的精神

- 判斷以舉證為之
  - 以數據、文獻理論為基礎
- 不憑直覺或經驗
  - 以科學方法驗證
    - 歸納、推衍
  - 以理性思考批判
    - 分析、比較、取捨
- 歸納、推衍、分析、比較、取捨的致勝關鍵也在於解讀數據

判讀臨床數據的態度

- 植基於病理生理的了解
- 著眼於從病人的觀點去領受事件對病人的影響

實證護理的表現

- 重視以問題為導向的行為
  - 藉發現問題、探索答案來了解現象
- 強調理性思考，
  - 針對「所見」進行學理與臨床之印證
  - 針對「所作」加強各項作業理論基礎之澄清
- 透過解讀數據
  - 了解現象
  - 印證學理
  - 澄清理論基礎

這代表什麼？

這對病人的影響是什麼？

我的解釋合學理嗎？臨床的其他數據與我的解釋吻合嗎？

我該做什麼以便對病人有利？

數據判讀的意義

- Professional Accountability
- Rational Reasoning
- Responsible performance

Close look at Vital Signs

Vital signs

Best Practice, Volume 3, Issue 3, 1999

What Constitutes Vital Signs

- 傳統Vital signs
  - measurement of temperature, respiratory rate, pulse rate and blood pressure.
- 文獻建議添加項目
  - nutritional status, smoking status, spirometry, orthostatic vital signs and pulse oximetry, pain
- 臨床上確實廣為接受之項目
  - pulse oximetry , smoking status, pain

Smoking related health problems

- Cardiovascular
  - Hypertension
  - vasculitis
- Respiratory
  - Increase the presentation and risk of developing emphysema
  - Increased the decrement of yearly reduction in FVC, FEV1
  - Fasten the speed of the developing COPD

Limitation of vital signs

- vital signs are quite limited in terms of detecting important physiologic changes.
- Examples of this include: their failure
  - to detect large blood losses,
  - to identify serious illness in infants,
  - to detect an inadequate plasma volume in burn injury patients.

(Discuss why? And how to do supplement ?)

Frequency of taking VSS

- VSS taking 已經成為 routine ，很少有人思考與病患需求的關係.
- 其實病患觀察應依據病患狀況需要，執行頻率應是一種臨床判斷而不是常規
- 此外，趨勢的觀察比單次的量值更為重要
- Pulse oximetry 應被視為a vital sign.

Body Temperature

- 體溫乃代表身體所保持的熱度，一般所稱的體溫是指體內核心溫度，並不包括體表溫度(Ganong,1992)。
- 是身體產生的熱量及散失的熱量兩者間平衡的結果。
- 在健康的正常人,體溫經常保持恆定,約在36-37.5℃,變化的幅度通常不超過1°F(0.6℃)(趙正豪,1992) 。

Heat generation

- 人體的肝臟和肌肉是身體生熱的主要部分
- 熱量的產生(消耗，energy expenditure, VO2)
  - VO2 at rest，3.5ml kg/min (1met)
  - 計算 70kg 的人一小時產生多少熱量

- 體溫每上升1℃，
  - 熱的產量即會增加13%，
  - 氧的使用與CO2的產生也增加13%
  - ？：何種患者對fever 耐受力不佳

Heat loss

- 輻射(Radiation):50-70%
  - 不需要依其他物質做媒介
- 對流(Convection):
  - 體熱藉血液流傳至體表,而將熱散失出去。
  - 在冷空氣中,血管收縮,使流至體表的血液減少,以減少熱的散失。
- 傳導(Conduction):15%
- 蒸發(Evaporation):
  - 吸收熱量使液體轉變為氣體。
  - 人體水分持續的自皮膚表面、呼吸道及流汗蒸發
  - 皮膚表面每蒸發1公克的水分,需散出0.58大卡的熱量(Ganong,1992)

Factors affecting body temperature

- 環境
- 年齡：
  - 嬰幼兒的體溫會比成人稍高約1°F；
  - 青春期正值發育旺盛期，體溫亦會高於成人一些；
  - 老年人的體溫便低於其他年齡群的體溫。
- 性別：
  - 女性比男性有較厚的皮下脂防層，可絕緣維持體熱，體溫會稍高男性。
- 24小時週期的生理節律：
  - 傍晚4點到晚上8點是一天中體溫最高，午夜至凌晨6點間體溫最低。
- 荷爾蒙的作用：
  - 甲狀腺素、生長激素、腎上腺素、黃體激素分泌增加，會使體溫上升；
- 飲食：
  - 飢餓、營養不良以及禁食等能量攝取不足時，會使體溫下降。
  - 進食熱的飲食後，體溫會略為上升，20到30分鐘後即可恢復正常。
- 活動量：運動使代謝速率加快
- 情緒
- 疾病：infection, injury

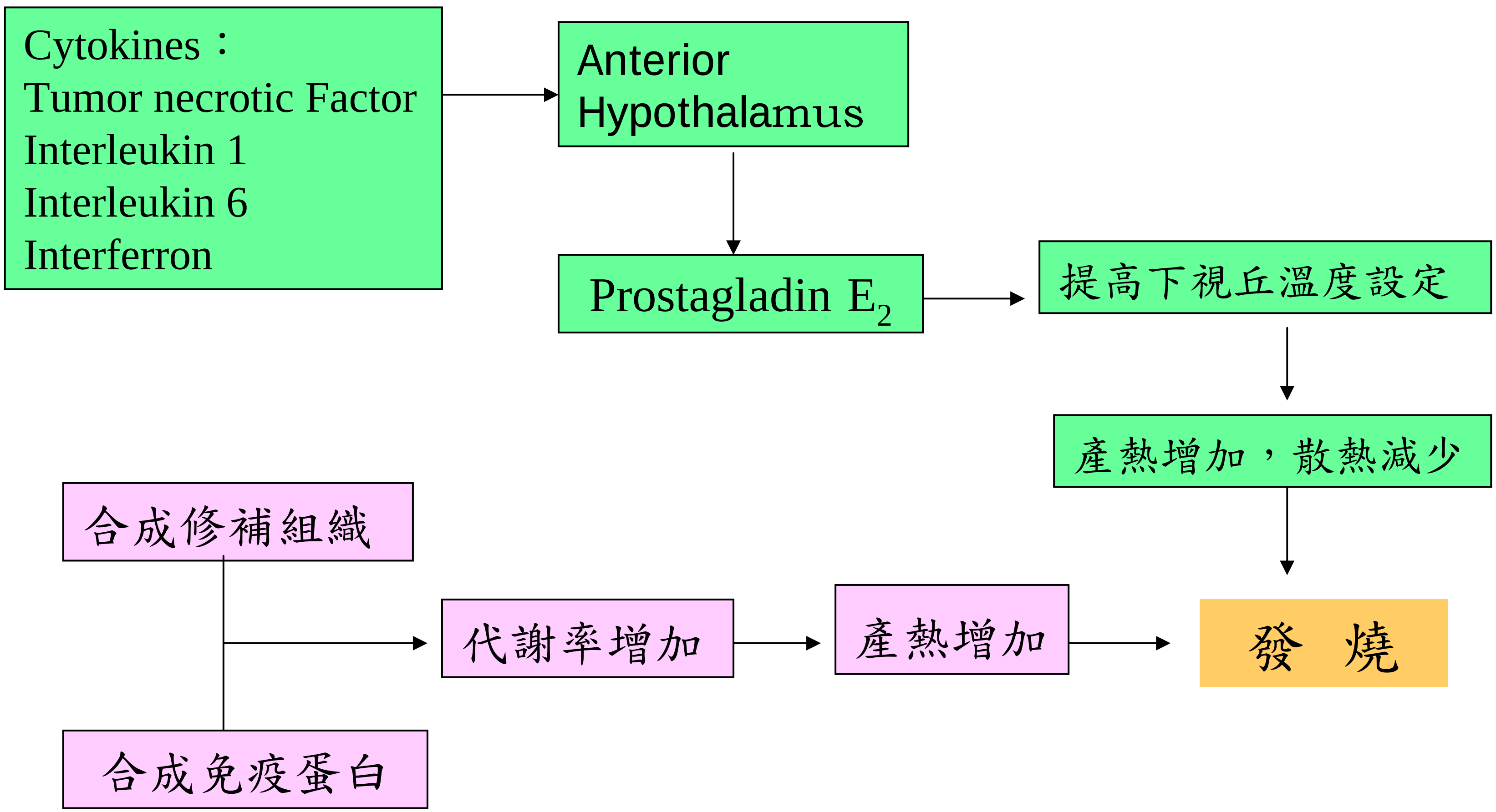
Instruments measuring temperatures

- glass mercury thermometer
- electronic thermometer
- pulmonary artery catheter
- endotracheal tube with temperature probe
- urinary catheter with temperature probe
- liquid crystal thermometer strip
- disposable thermometers
- infrared (tympanic) thermometers

Common Issue in BT taking

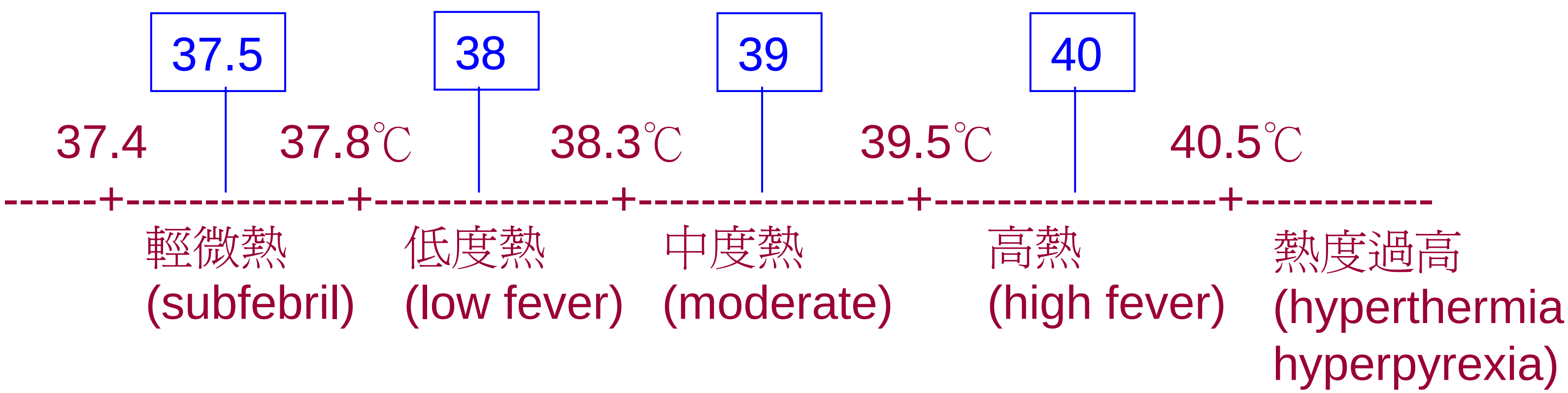
- **Rectal temperature**
  - 重要問題：直腸穿孔
- **Axilliary temperatures**
  - 正常範圍大
  - 上肢靜脈注射並不影響腋溫測量值
- **Oral temperature**
  - 研究顯示放舌下後腔量值偏高
  - 喝冷熱水會影響宜間隔15 to 20 分
  - 氧療、吸菸不影響
- **Tympanic temperature**
  - 耳垢影響量值
  - 中耳炎與冷環境影響極微，室溫高則有顯著影響

發燒的機轉


Cytokines：
Tumor necrotic Factor
Interleukin 1
Interleukin 6
Interferon
Anterior Hypothalamus
Prostagladin E_2
提高下視丘溫度設定
產熱增加，散熱減少
發　燒
合成修補組織
合成免疫蛋白
代謝率增加
產熱增加

發燒的定義 （Fever）

- 當核心溫度大於38℃就可以定義為發燒
- 體溫過高(Hyperthermia)是指體溫上升，但體溫定位點並未上升，只是核心體溫超過體溫定位點時稱之，與發燒稍有不同，通常由於產熱及散熱不平衡所致（Guyton，1992）。



發燒對身體的影響

- 增加營養素熱量需求
- 增加氧氣需求
- 增加CO_2，代謝產物
- 增加脫水與電解質之不平衡

增加心肺負擔
造成肌肉酸痛疲憊

- Dangerous fever
  - 超過41℃時可引起肌細胞快速代謝，造成橫紋肌溶解、代謝性酸中毒、肌肉僵硬、心血管系統不穩定，導致死亡。
  - 而當發燒高於41℃時，便能產生譫妄及痙攣；
  - 高於42℃時，產生意識障礙；
  - 當高於42℃時間超過4小時以上時，就可能產生恆久性的腦部損傷。

藥物導致發燒

- 服藥後7-10天出現發燒，剛開始熱度不高，以後慢慢增加
- 停藥後，燒在48小時內迅速緩解
- 機轉：
  - 影響身體散熱功能，例如抑制排 汗，antihistamines、anticholinergics等。
  - 影響身體心血管系統對體溫過高的反應，如diuretics、beta-blockers。
  - 增加代謝以升高體溫，如 thyroid hormones。

惡性體溫過高

- 麻醉型體溫過高：
- 為極少數的遺傳性疾病當使用麻醉劑時才會產生如 ：halothane、succinylcholine等
- 造成骨骼肌中肌漿網鈣離子濃度不正常升高，使肌肉活動過度，致產熱增加、體溫上升
- 病人心跳加速、呼吸急促、盜汗、肌肉腫脹、急性腎衰竭…等，可致生命危險

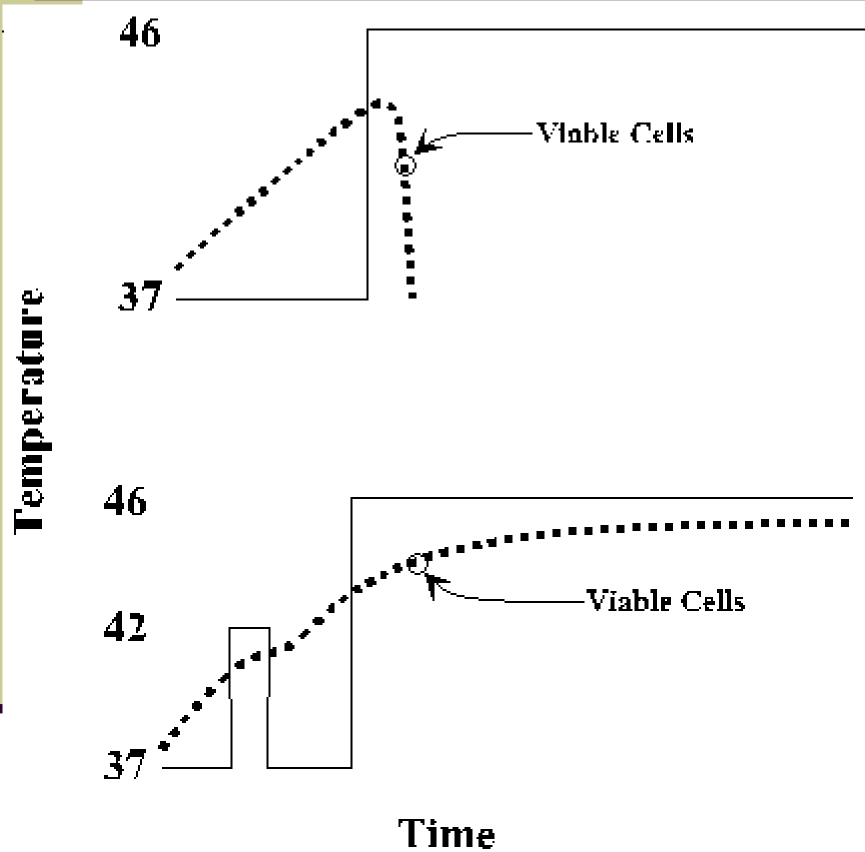
環境溫度過高引起之熱失調：

- 熱痙攣(heat cramps)：
  - 身體在劇烈運動後，發生骨骼肌間歇性、疼痛性痙攣的一種熱失調暑熱症候群。
  - 在炎熱的天氣裡，劇烈運動及出汗很多會使身體損失許多氯化鈉，而發生痙攣。
- 熱衰竭或熱虛脫(heat exhaustion)
  - 由於暴露在高溫環境中，體液容積不足，使身體血管舒縮功能失調，周圍血管無法得到足夠的血液，以供給排汗散熱。
- 中暑(heat stroke)：
  - 由於下視丘的出汗調節機能與其他熱散失機能衰竭導致身體過多的熱無法消散使體溫高到41℃或以上的現象。

Heat Shock Proteins

- Molecular chaperon (cytoprotection protein)
  - Molecular chaperones bind and stabilize proteins at intermediate stages of folding, assembly, translocation across membranes and degradation
- 由暴露高熱產生之 heat shock proteins具細胞保護作用，可對抗細胞凋萎(apoptosis)

Precondition and Survival



45°C → die

43°C → recovery → 45°C → live

(Challenge)

6-18 hr

(Precondition)

1st—stress response → 2nd– recovery → 3rd– stress tolerance

Impact of knowledge about HSP on clinical practice

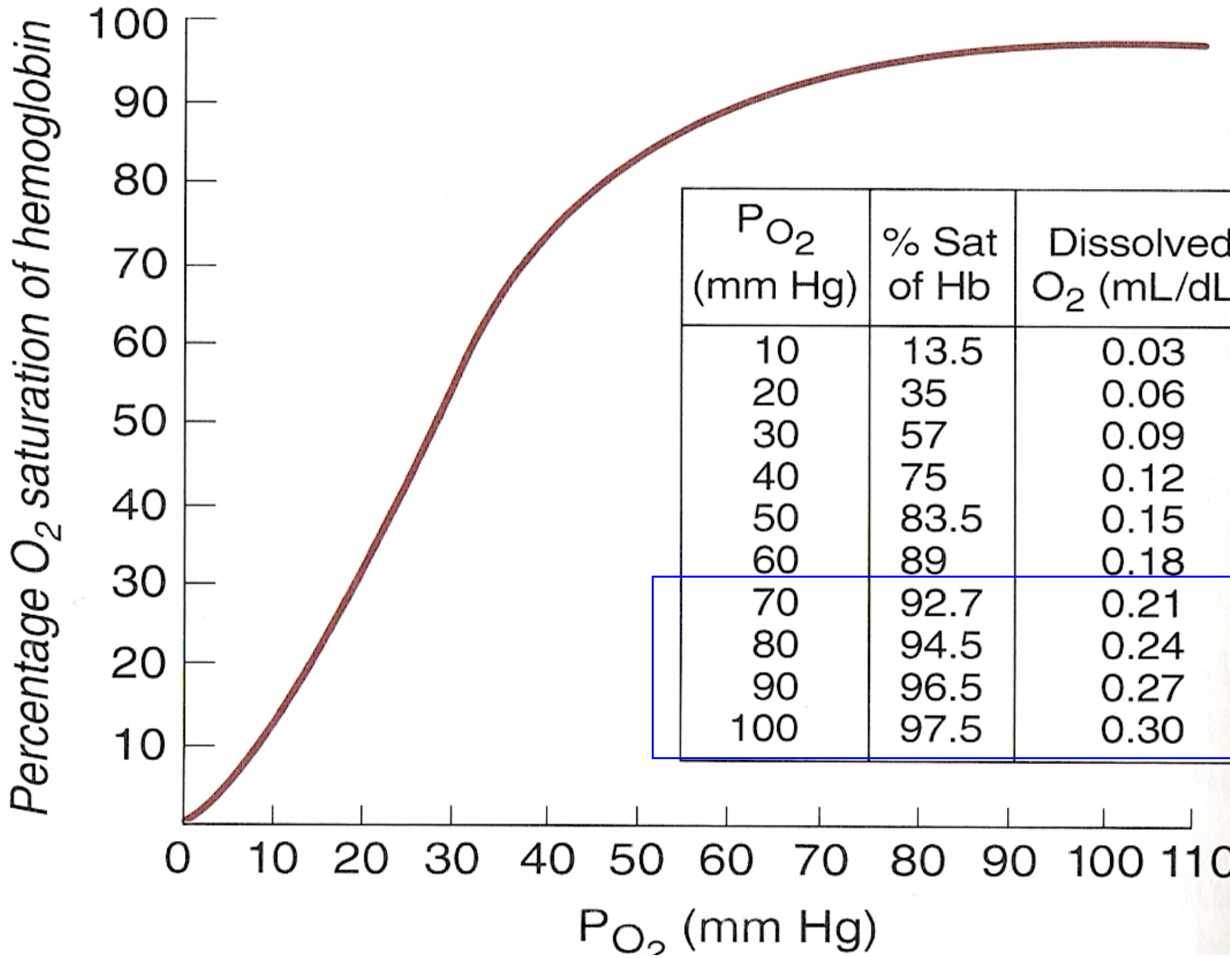
- Fever management
- The benefit of exercise
- The benefit of hot water soaking
- The benefit of foot soaking with hot water

Limitation of Respiratory Rate

- 到急診時SaO_2<90%的人只有 33% 呼吸率增加
- 在六個月以下嬰兒，無法以呼吸率分辨疾病嚴重度
- 因呼吸率參考性有限，測量SpO_2 有其必要。

(進一步在Oxygenation中再討論)

1.PaO2 vs. SaO2



P_{O_2} (mm Hg)	% Sat of Hb	Dissolved O_2 (mL/dL)
10	13.5	0.03
20	35	0.06
30	57	0.09
40	75	0.12
50	83.5	0.15
60	89	0.18
70	92.7	0.21
80	94.5	0.24
90	96.5	0.27
100	97.5	0.30

Limitation of Pulse rate

- When heart rate is of concern, cardiac monitors are used to determine not only rate, but also rhythm.
- The role of the "pattern of the pulse",
  - regular pulse versus irregular pulse
  - strong pulse versus weak pulse,
  - Variation with respiration
- ? : the clinical significance

(進一步在Perfusion 中再討論)

Blood pressure

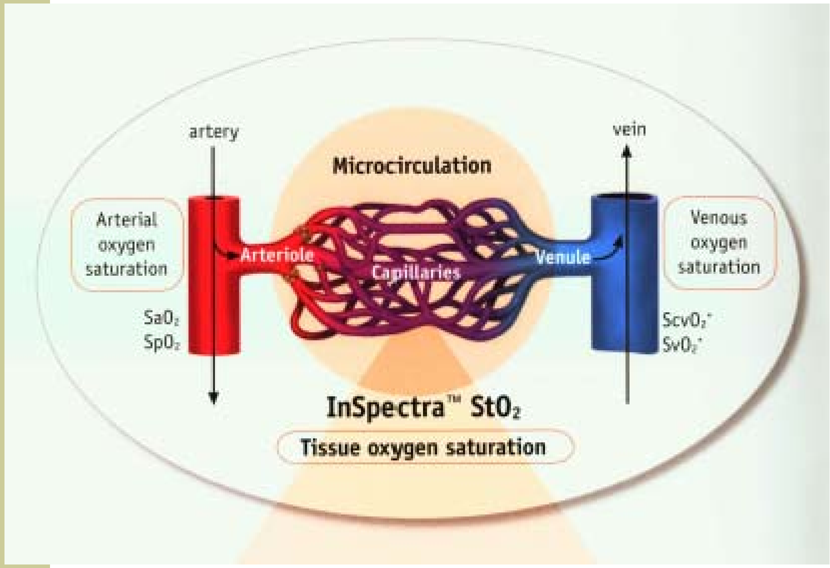
- 趨動血液循環全身的動力，過高過低均不宜
- 影響間接血壓量值之因素
  - palpation versus auscultation
  - cuff size,
  - bell versus Diaphragm
  - position of arm during measurements and
  - health care workers technique
- 間接血壓測量並不永遠能正確反映重症病患之血液動力學

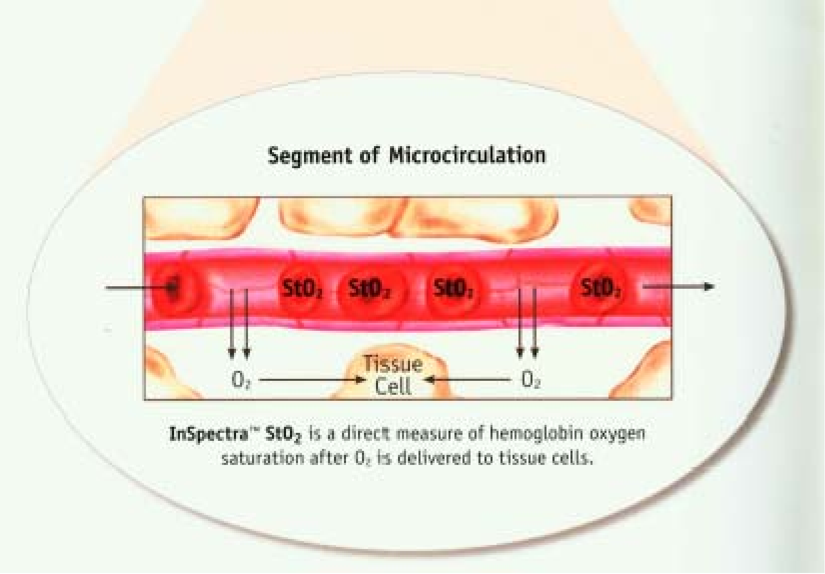
(進一步在Perfusion中再討論)

文獻對於血壓測量的建議

- 靜坐5分鐘，手臂支持與心臟平
- 氣囊長度需至少為臂圍之 80%
- 30分鐘內未吸菸或喝咖啡
- 相隔2分鐘再量一次，取平均值，兩次差大於 5mmHg 需再量一次

Inspection of tissue Oxygen Saturation



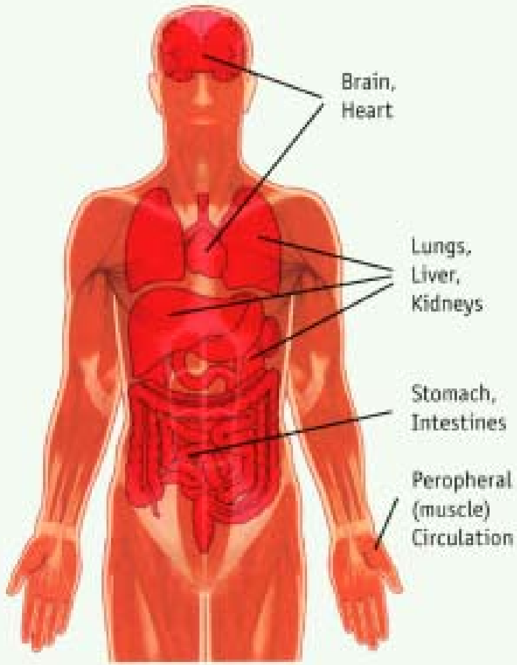


New Issue

What is the Value of **InSpectra™ StO₂**?

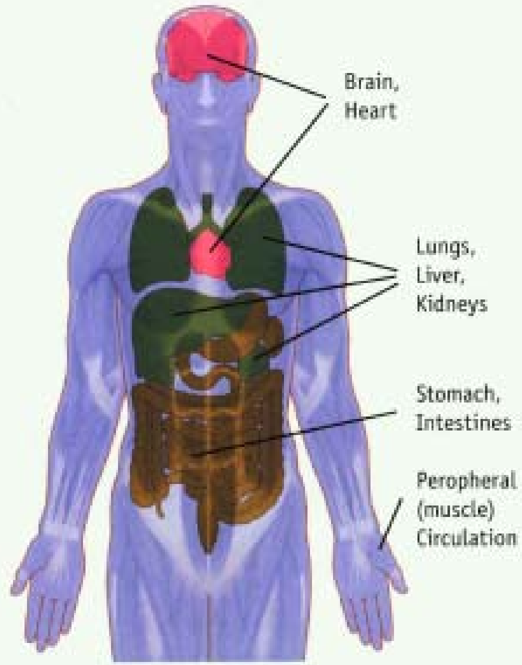
In response to shock, blood is shunted from skin and skeletal muscle to core organs.

InSpectra™ StO_2 permits real-time, continuous monitoring of peripheral perfusion and is an early indicator of hypoperfusion.

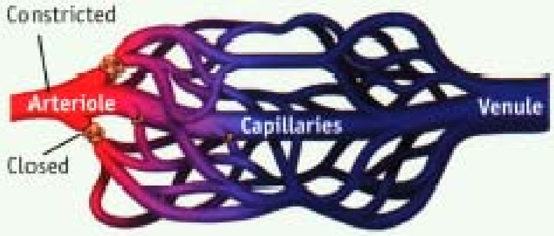


Normal

Normal Microcirculation



Perfusion Changes During Shock



Perfusion Microcirculation in Response to Shock

How is InSpectra™ StO_2 Measured?

Light scatters in the tissue and is absorbed differently by oxygenated and deoxygenated hemoglobin, primarily in the microcirculation. Light returned to the monitor is displayed as **InSpectra™ StO_2**.

How to interpret **InSpectra™ StO_2** readings in trauma patients

InSpectra™ StO_2 Clinical Range (%)

Indicates Hypoperfusion*

- Assess patient for causes of inadequate perfusion
- Consider interventions to improve perfusion status
- Continue to monitor patient's **InSpectra™ StO_2**

Indicates Adequate Perfusion*

- Continue to monitor patient's **InSpectra™ StO_2**

- **InSpectra™ StO_2** indicates hypoperfusion as well as base deficit or lactate in trauma patients[1,3]
- 72%–95% **InSpectra™ StO_2** range in 95% of 707 volunteers[2]

*These perfusion status ranges are derived from a multi-site, prospective clinical trial sponsored by Hutchinson Technology Inc. The patient population in the study consisted of trauma patients suspected of, or experiencing, hemorrhagic shock.

[1] Cohn et al. Tissue oxygen saturation predicts the development of organ dysfunction during traumatic shock resuscitation. *J Trauma.* 2007:62 (1): 44–55.

[2] Crookes, B.A. et al. Can near infrared spectroscopy (NIR) identify the severity of shock in trauma patients? *J. Trauma.* 2005:58 (4): 806–816.

[3] Moore FA. Tissue oxygen saturation predicts the development of organ failure during traumatic shock resuscitation. In: Faist, E, ed. *International Proceedings of the 7th World Congress on Trauma, Shock, Inflammation and Sepsis;* Munich, Germany, 13–17 March 2007. Bologna, Italy: Medimond; 2007:111–114.

Hemoglobin Oxygen Saturations

	SaO_2	SpO_2	SvO_2	$ScvO_2$	StO_2
Measure of	Arterial Oxygen Saturation	Arterial Oxygen Saturation (Pulse Ox)	Mixed Venous Oxygen Saturation	Central Venous Oxygen Saturation	**Tissue Oxygen Saturation**
Measure of % Hemoglobin O_2 Saturation	Yes	Yes	Yes	Yes	**Yes**
Place of Measurement	Arteries	Pulsing Arteries	Pulmonary Artery	Superior or Inferior Vena Cava, Right Atrium	**Peripheral Microcirculation**
Method of Measure	Arterial Blood Draw, Blood Gas Analyzer	Pulse Oximeter	Pulmonary Artery Catheter	Central Venous Catheter	**InSpectra™ StO_2 Tissue Oxygenation Monitor**
Use of Measure	O_2 Loading in Lungs	O_2 Loading in Lungs	Systemic Assessment of O_2 Consumption	Regional Assessment of O_2 Consumption[1]	**Tissue Perfusion Status**
Normal Range	96-100 %	96-100 %	60-80 %	> 70% (5-10 % > SvO_2)	**> 75%**
Changes During Shock and Resuscitation	When Heart or Lung Functions are Compromised		With Systemic O_2 Consumption Changes		**Immediate Response to Early Peripheral Perfusion Status Changes**