Taipei Medical University - Shuang Ho Hospital

Integrated Intelligent and Innovative care for chronic airway disease patients

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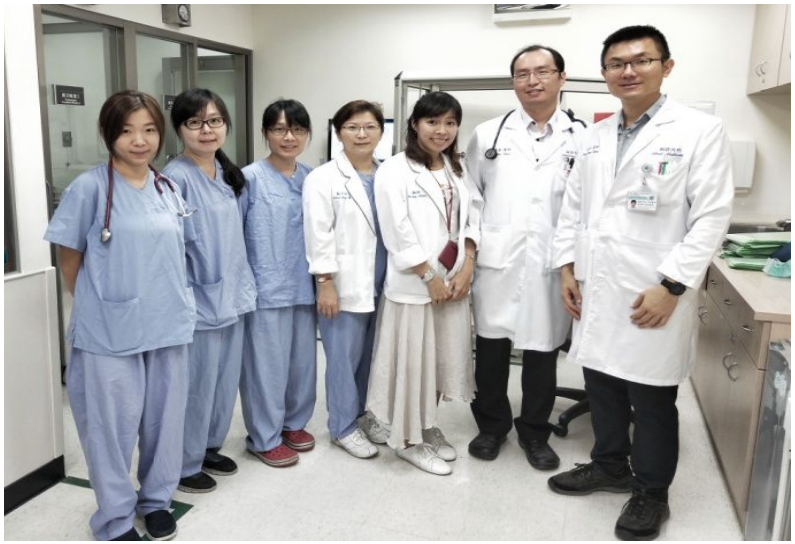
Attending Physician, Pulmonary medicine, SHH
Assistant professor, Internal medicine, Taipei medical university

Bullet points

- **Integrated :**
  - Patient flow in outpatient department.
  - Multi-team approach for advanced COPD patients with the electronic structural medical record.
- **Intelligent, Innovative:**
  - Individualized rehabilitation program and provide action plan.
  - Early detection and early prevention with wearable device for airway disease patients.

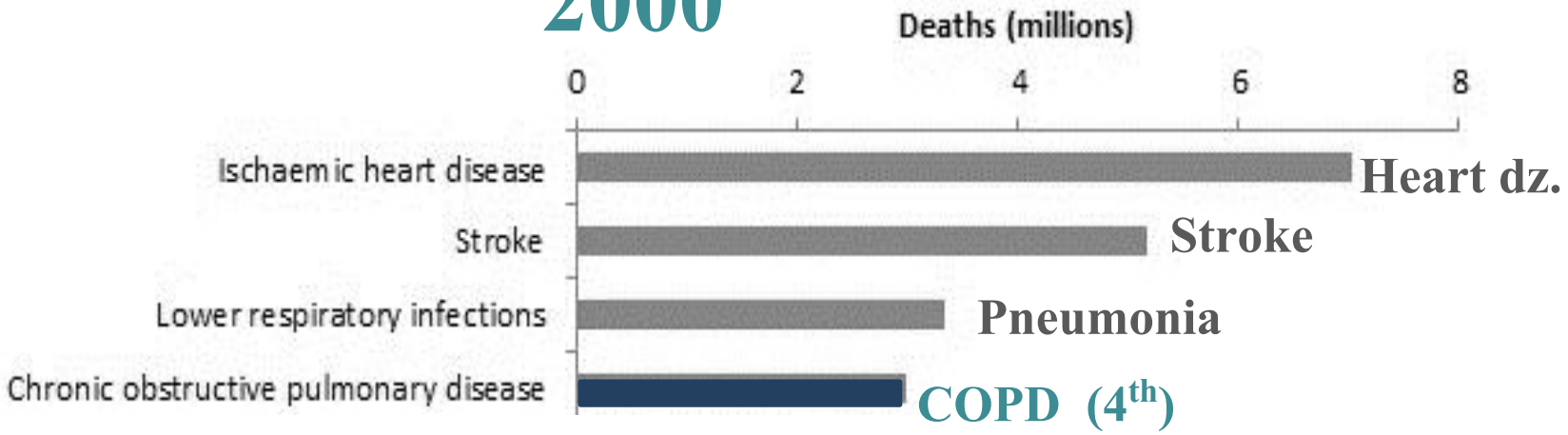
I care and

Integrated, intelligent and innovated care for COPD patients

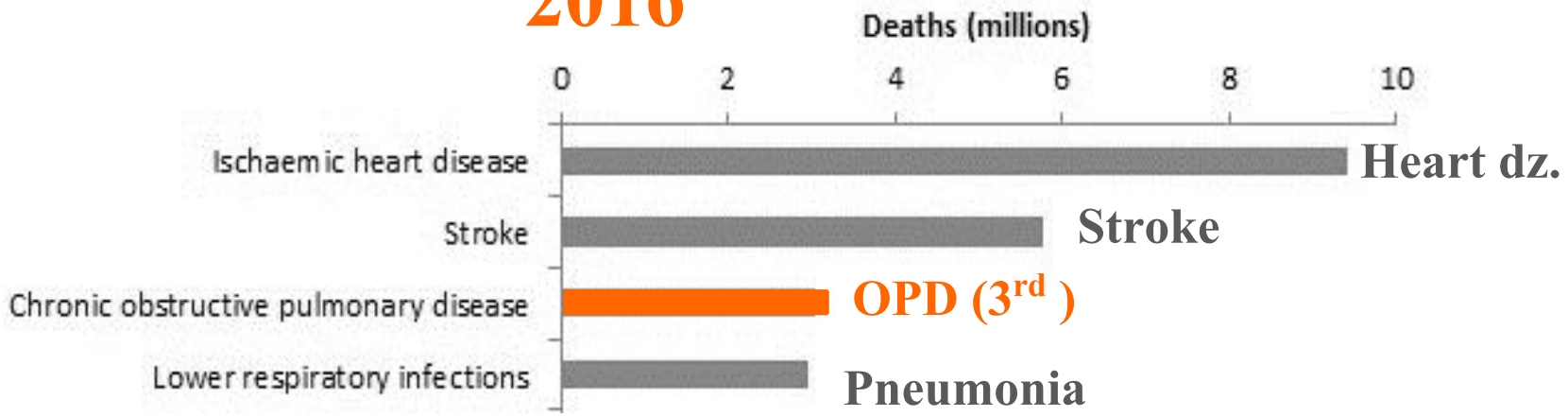


WHO Top Ten Death

2000



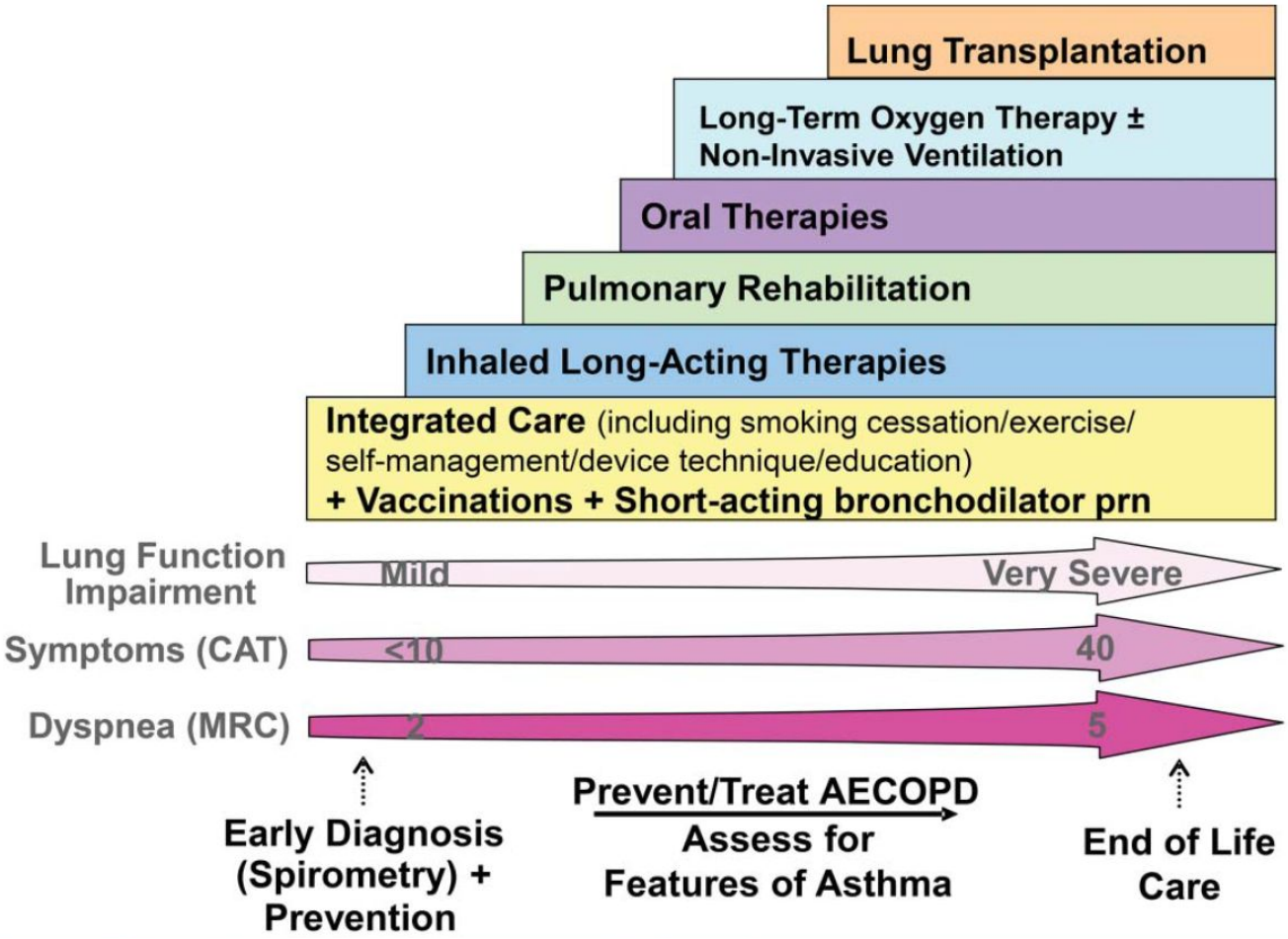
2016



Top Ten Death in Taiwan

Not in Top Ten death

7th leading cause for death

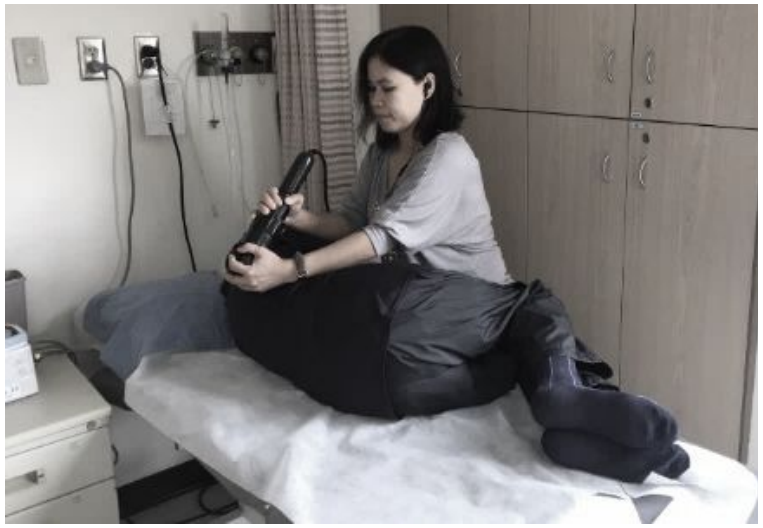


ATS guideline : Education and Case management are both important

Individuated action plan can further decrease Acute Exacerbation (AE).

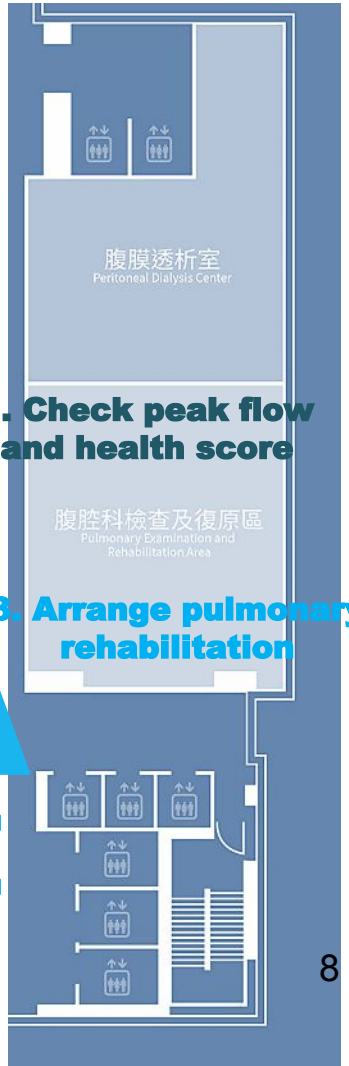
Ref. Can J Resp Cri and sleep 2017; 1(4): 222-241; Chest 2015; 147(4):894-942)

Pulmonary Rehabilitation



Chest medicine OPD (1st Floor)

Pulmonary rehab. Room (2F)



1. Check peak flow and health score

2. Visiting Doctors

3. Arrange pulmonary rehabilitation

COPD patients in our hospital

Do-Check-Act-Move (Distance, Time)

Steps		作業	確認	等待	移動	距離(M)	時間
1	Doctors	●	□	D	⇨		5 Min
2	Go to 2nd floor, PR room	○	□	D		300	5 Min
3	Wait for case manager	○	□	D	⇨		10 Min
4	Health education	○	■	D	⇨		5 Min
5	Go to 1st floor, Clinics	○	□	D		300	5 Min
6	Wait for a visit	○	□	D	⇨		20 Min
7	Doctors consultation	●	□	D	⇨		5 Min
8	Go to 2nd floor, PR room	○	□	D		300	5 Min
9	Pulmonary reha.	●	□	D	⇨		60 Min
	小計	3	1	2	3	900	120 Min

9 steps, 120 minutes

Waiting and Moving : 5 steps (55%)

COPD patients in our hospital

COPD patients in our hospital

- No. of COPD patients in our hospital : 300
- No. of COPD patients enrolled for Case management: 193
- Only 10.3% patient enrolled for pulmonary rehabilitation evaluation

	Dz. category	A	B	C	D
AE/year	SHH	0.16	0.59	3	3.25
	International	0.32	0.45	0.58	0.74

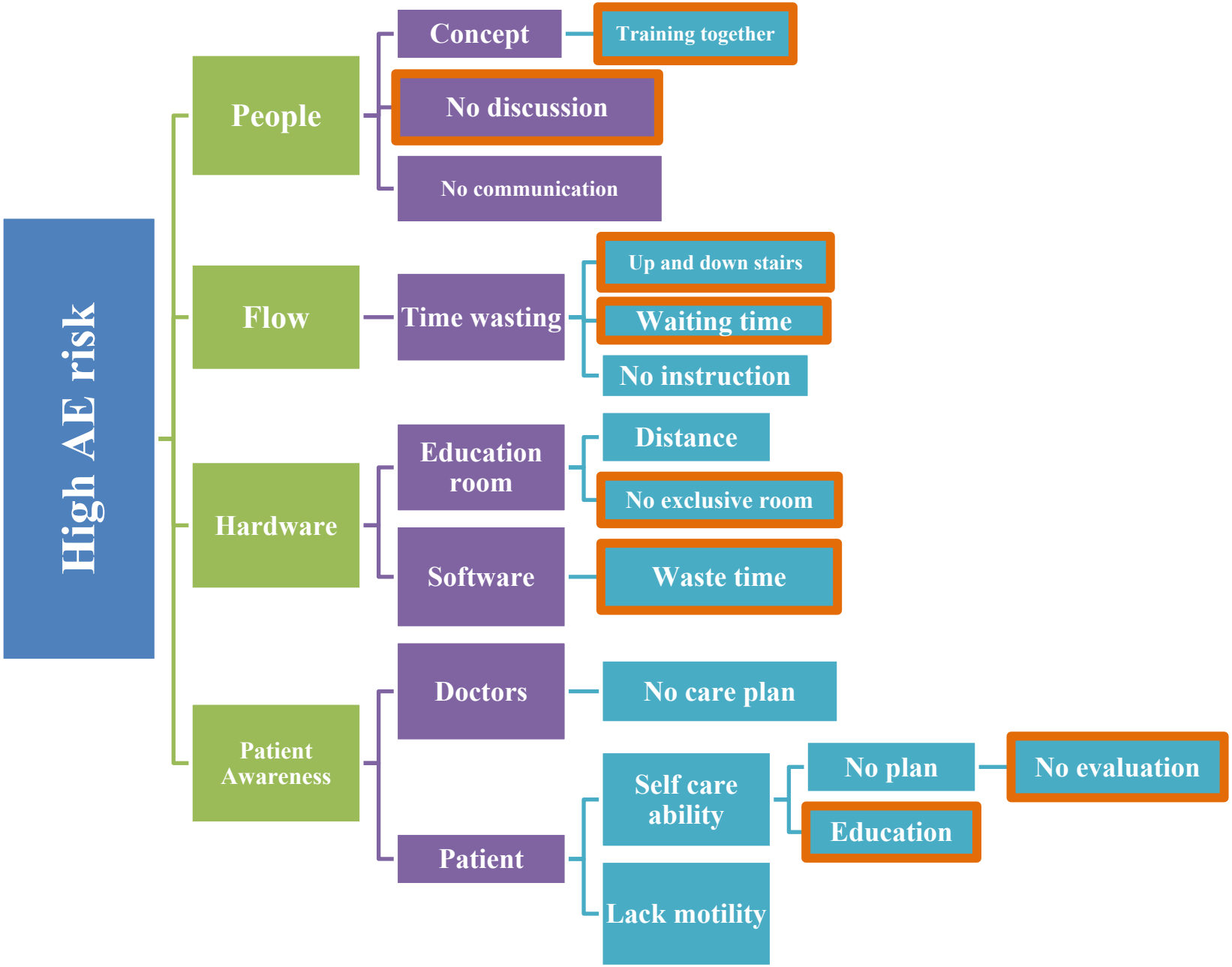
COPD patients in our hospital

	AE in previous year	No AE in previous year	P value
No. of cases	145 (75.1%)	48 (24.8%)	
Age	67.56 (SE 4.3)	71.7 (標準誤1.4)	P=0.583
Gender			
Male	132 (75.9%)	42 (24.1%)	P=0.576
Female	13 (68.4%)	6 (31.6%)	
Smoking status			
Never smokers	83 (76.2%%)	26 (23.8%)	P=0.418
Smokers	62 (73.8%)	22 (26.2%)	
CAT score	5.7 (SE 0.4)	10.4 (SE 0.4)	P<0.001
FEV1%	55.7 (SE 2.8)	50.7 (SE 6.3)	P=0.413
BMI	23.8 (SE 0.3)	23.2 (SE 0.8)	P=0.428

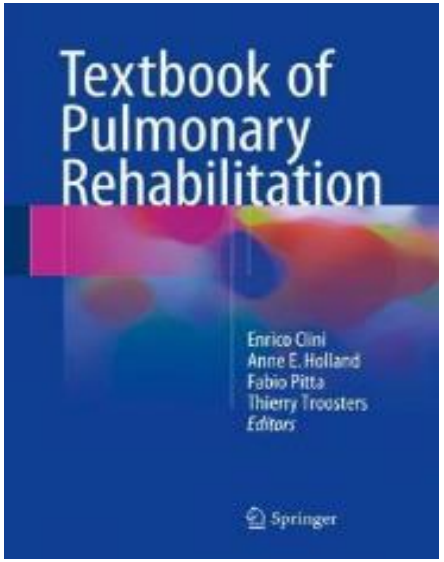
Our hospital vs other medial centers

	SHH	A	B	C	D	E
Pul. Rehabilitation room	O	O	X	X	X	O
Case manager	O	O	O	X	O	O
Pulmonary exercise test	O	O	O	X	X	X
Comprehensive Health education	X	O	X	X	X	X
Rehabilitation evaluation	X	O	X	X	X	X
Individualized action plan	X	X	X	X	X	X

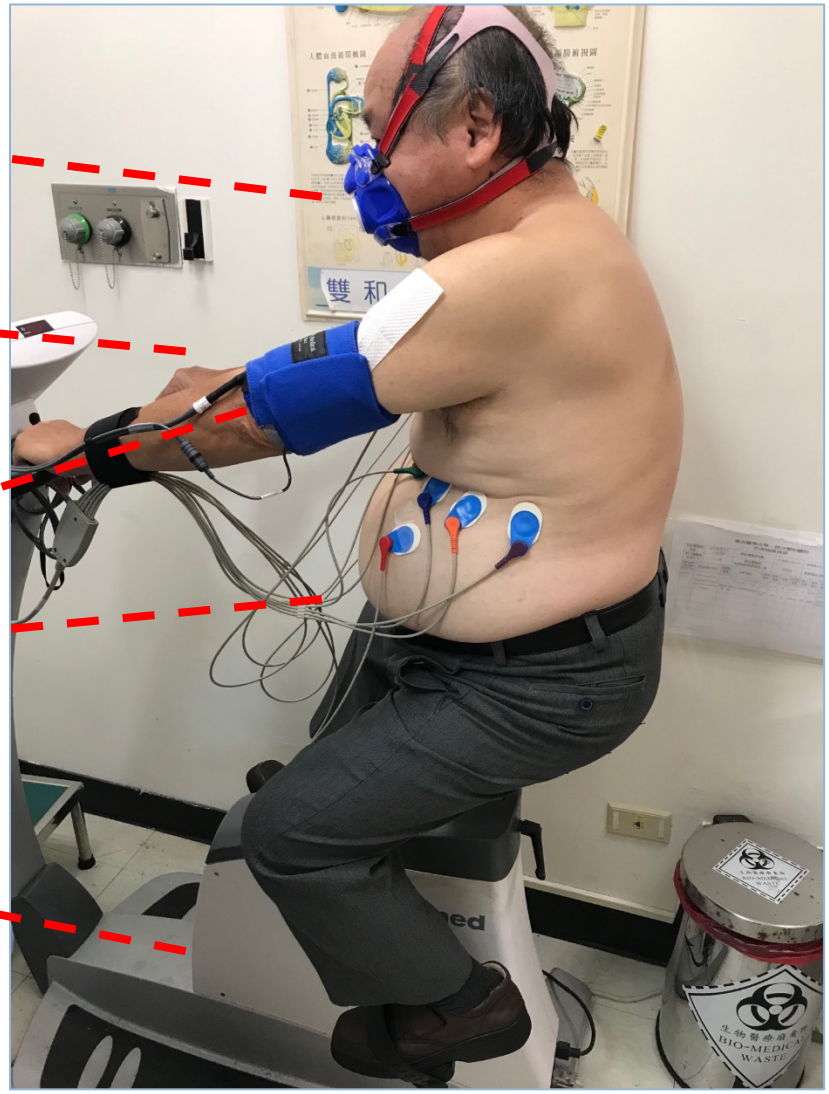
System diagram for casual relationship analysis



Strategy 1. Reading group, Monthly case discussion

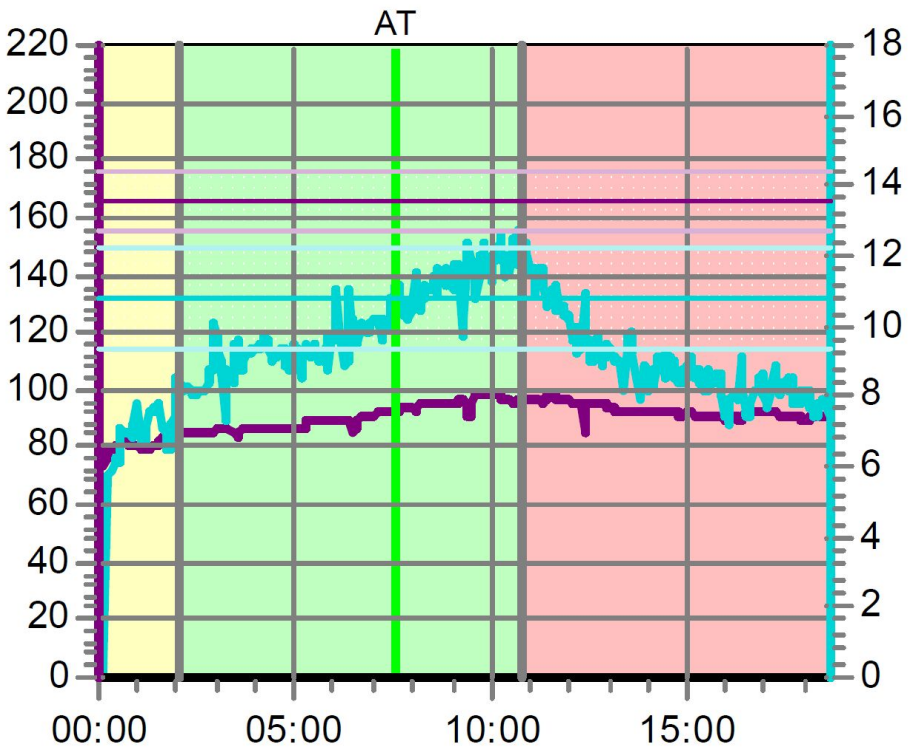


CPET(cardiopulmonary exercise testing)

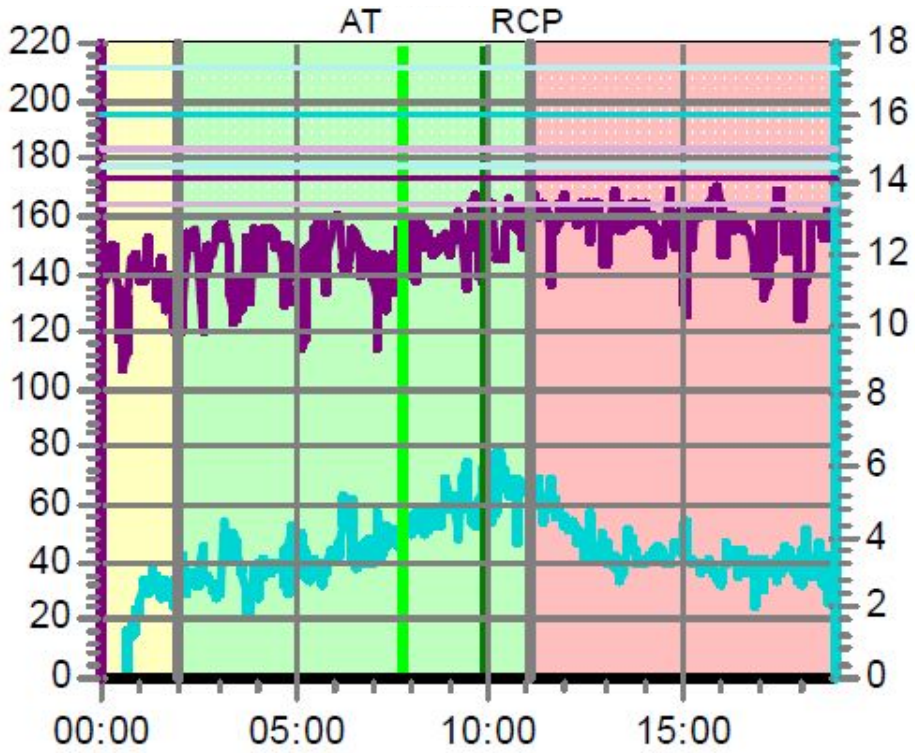


CPET report 1/3. Cardiovascular response

Inadequate HR response during exercise



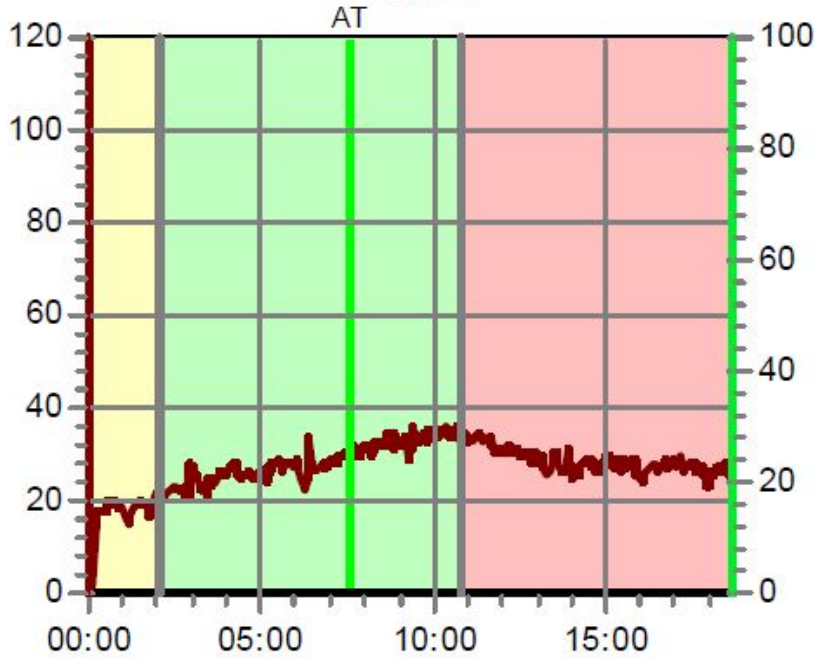
Inadequate stroke volume response

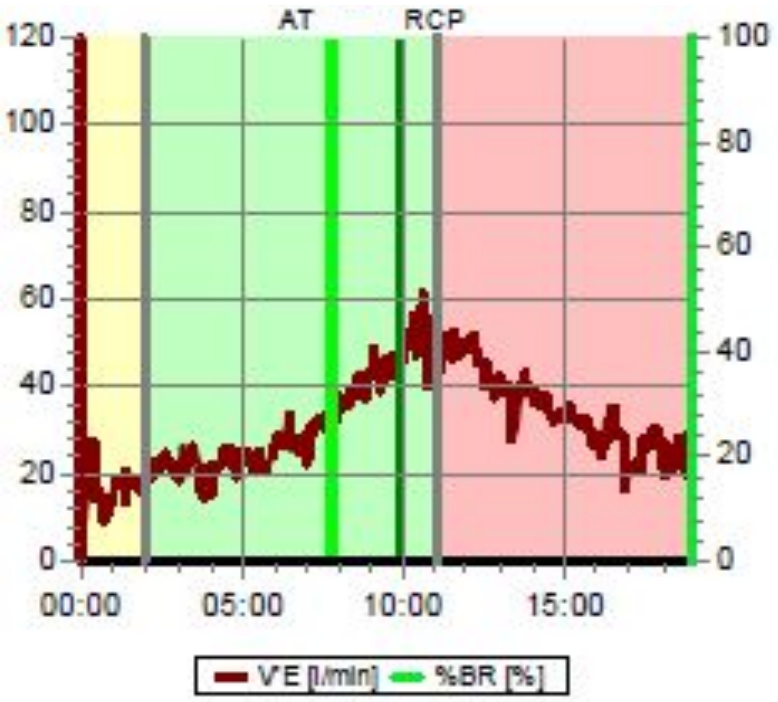


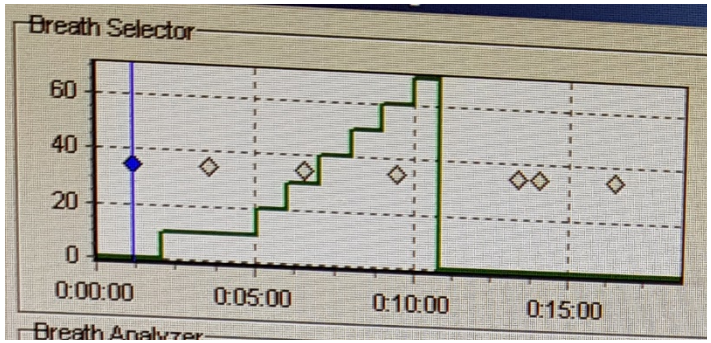
HR [1/min] V'O2/HR [ml]

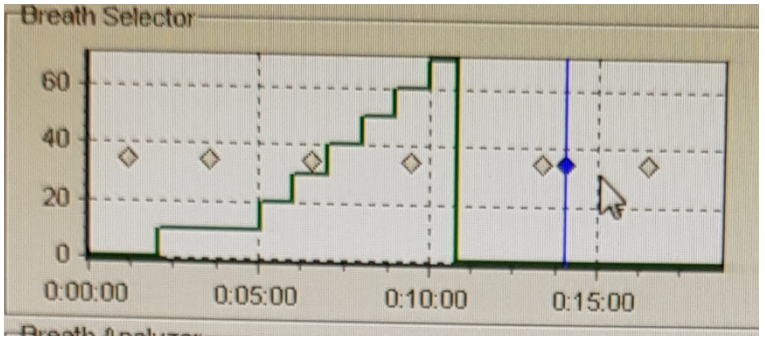
Oxygen pulse

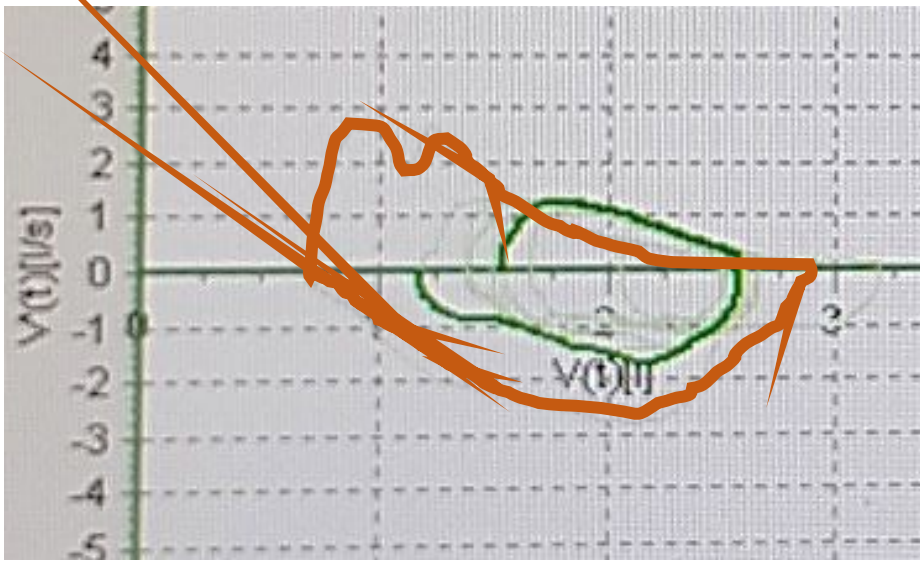
CPET report 2/3. Ventilatory response

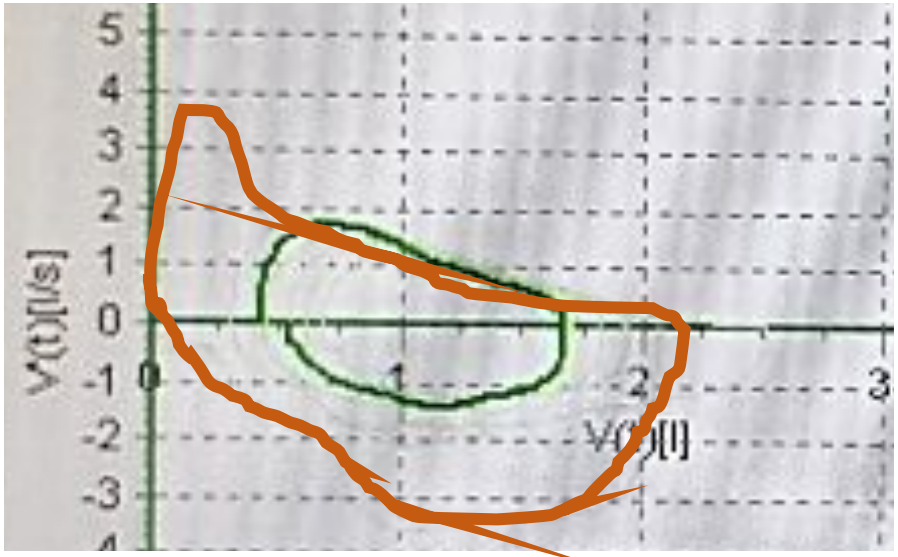




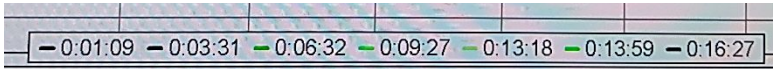

Breath Selector
60
40
20
0
0:00:00
0:05:00
0:10:00
0:15:00
Breath Analyzer


Breath Selector
60
40
20
0
0:00:00
0:05:00
0:10:00
0:15:00


V'(t)[l/s]
V(t)[l]

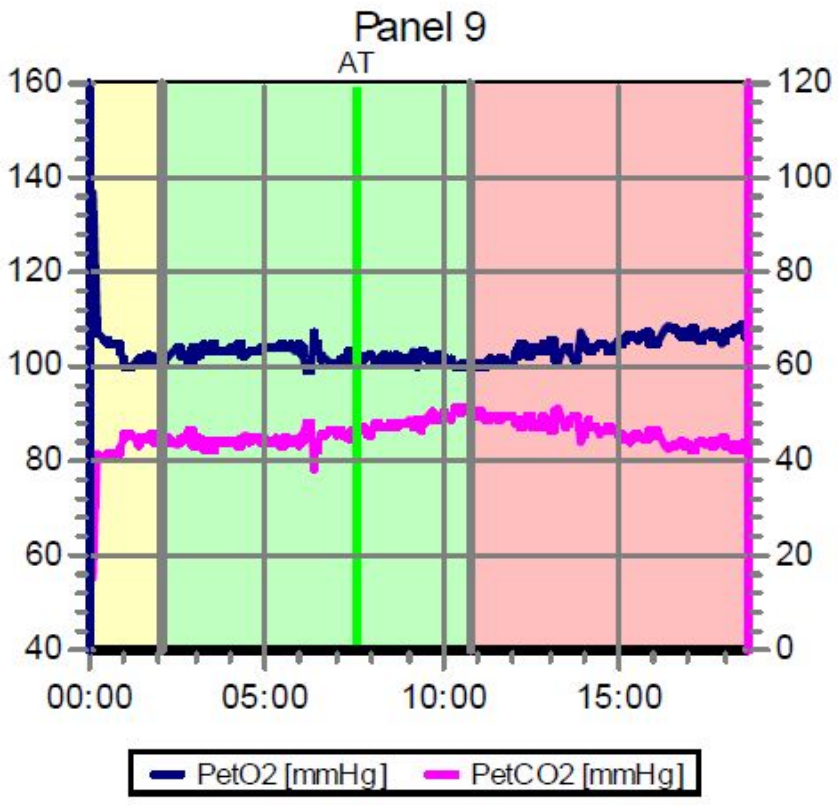

V'(t)[l/s]
V(t)[l]

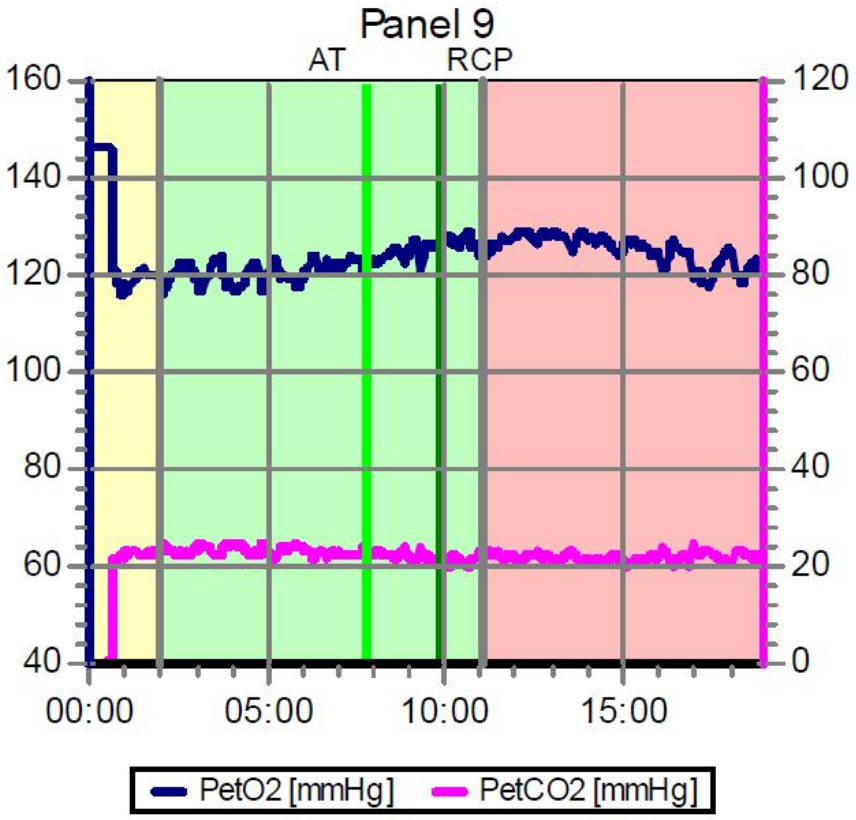

V'(t) [l/s]
V(t) [l]


0:01:09
0:03:31
0:06:32
0:09:27
0:13:18
0:13:59
0:16:27

CPET report 3/3. Gas exchange

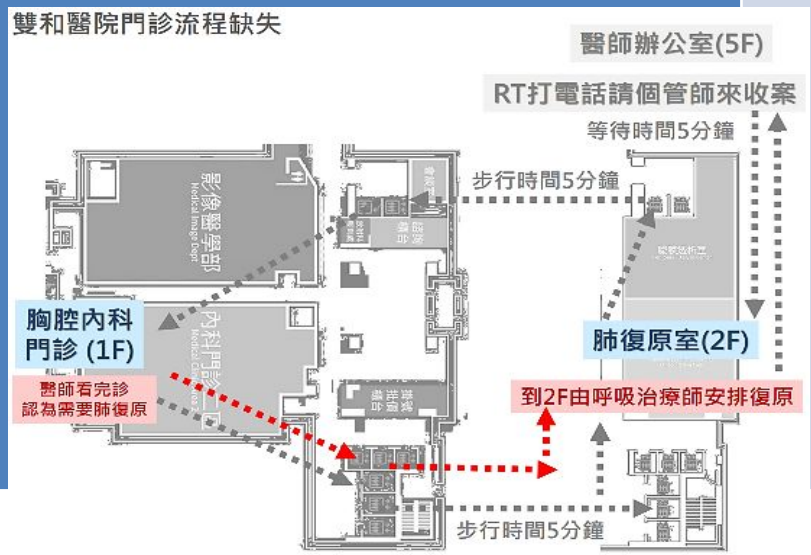
Low PetCO2
=Dead space
=> Suspected pul HTN



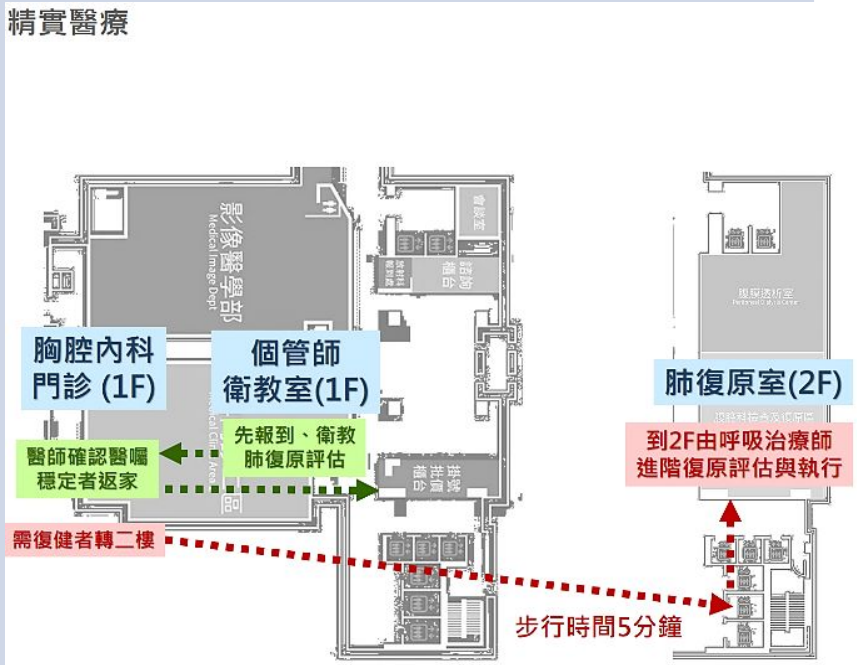


Strategy 2. Lean healthcare

Before



After



Strategy 2. Lean healthcare

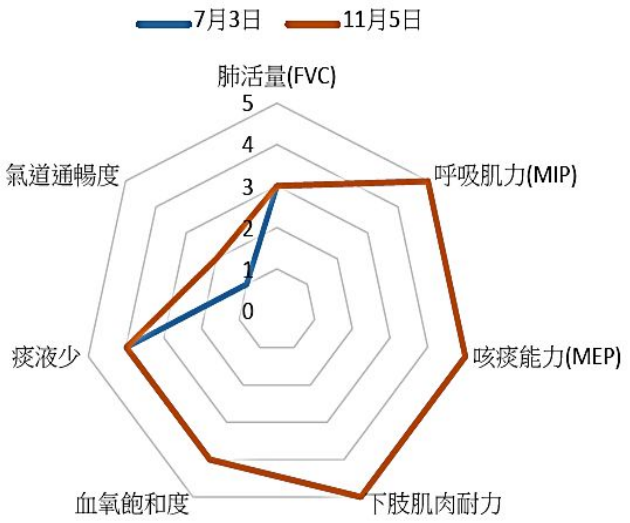
步驟	就診流程(改善後)	作業	確認	等待	移動	時間	距離(M)	消除	合併	重排	簡化
	胸腔科醫師看診	○	□	D	⇨	8 分鐘		V			
	移動到二樓復原室	○	□	D	⇨	7 分鐘		V			
	等待個管師收案	○	□	D	⇨	10 分鐘		V			
1	個管師收案評估	○	■	D	→	10 分鐘				V	
	移動到一樓門診	○	□	D	↠	5 分鐘	300	V			
2	等待看診	○	□	D	→	10 分鐘					V
3	胸腔科醫師看診	○	■	D	→	8 分鐘					
4	移動到二樓復原室	○	□	D		5 分鐘	300				
5	呼吸治療師執行肺復原	●	□	D	→	60 分鐘					
	小計	2	1		1	91 分鐘	300				

Reduce waiting time and Moving time, 120 minutes -> 91 minutes

Strategy 3. Individualized health education

E-book for health education

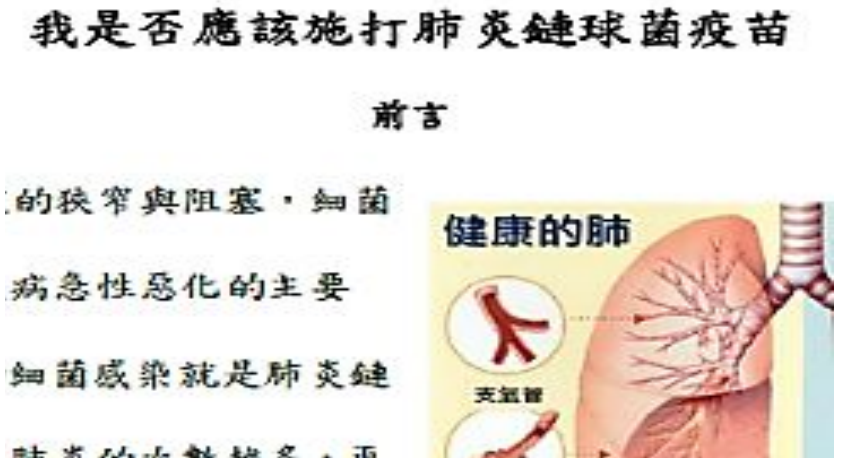
Strategy 3. Individualized health education



Individualized

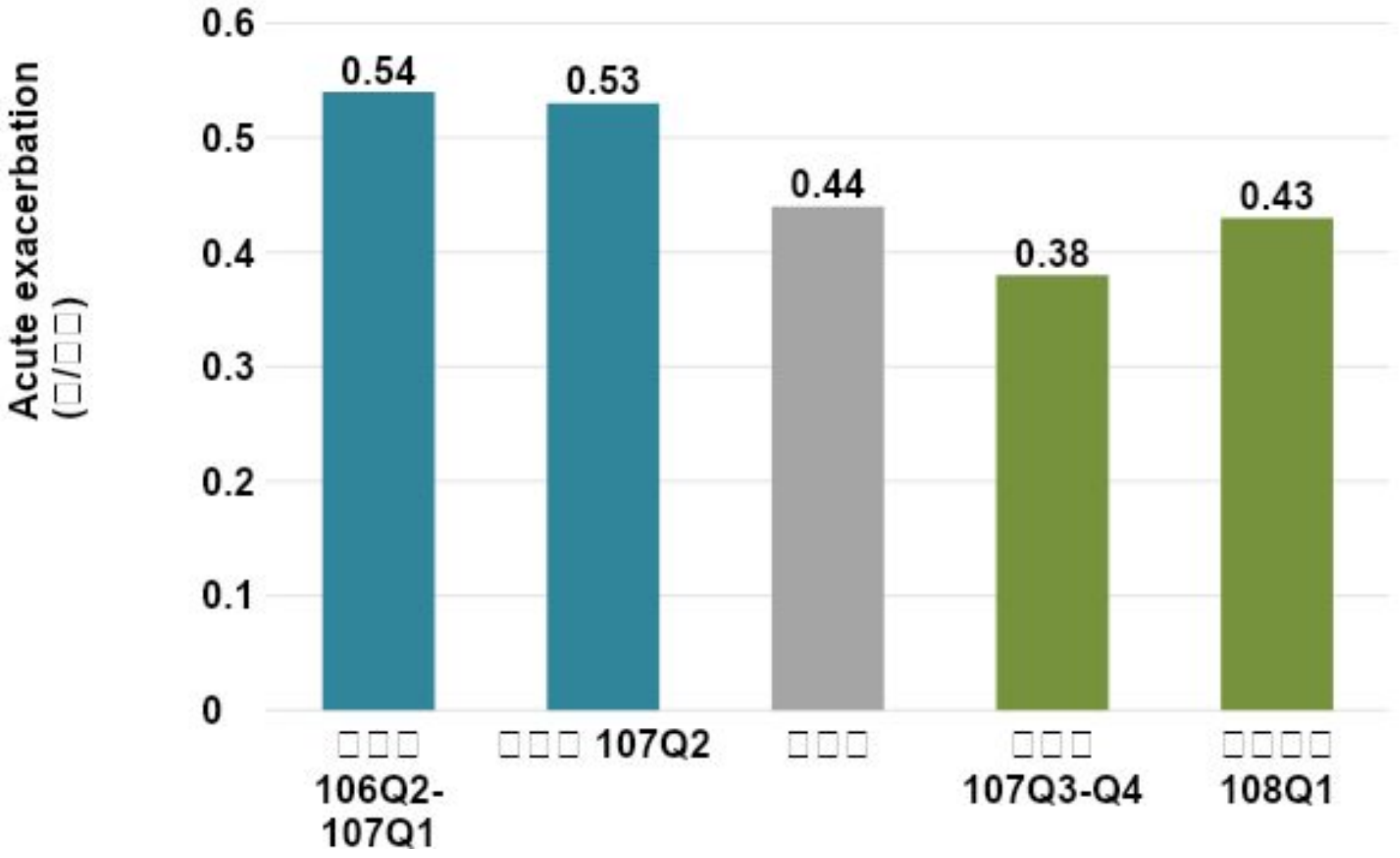
- Problem identification
- Action plan
- Health passbook

Strategy 3. Individualized health education

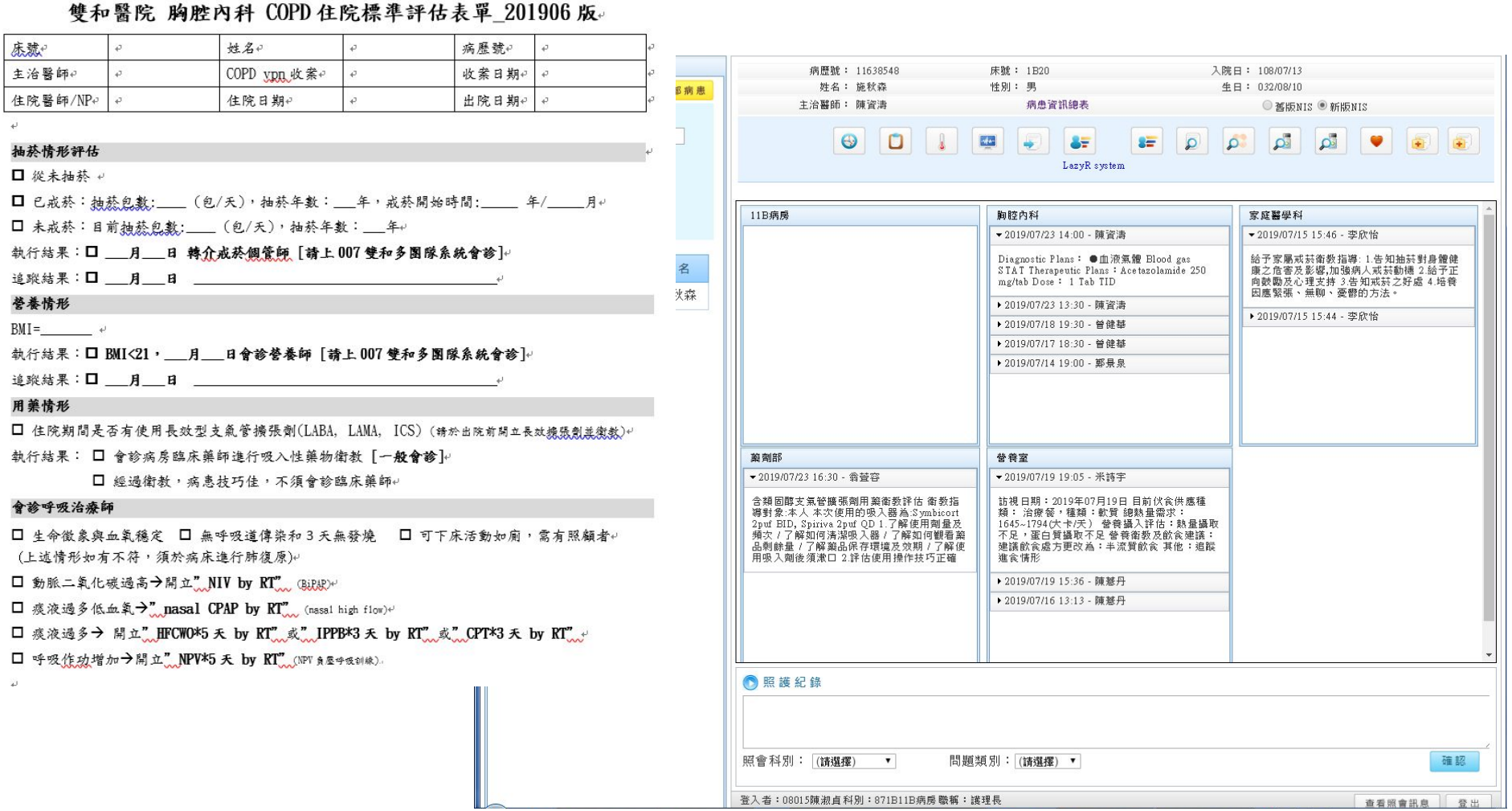


E-book for health education

Share decision making tool for pneumococcal vaccine


Acute exacerbation
(□/□□)
0.6
0.5
0.4
0.3
0.2
0.1
0
0.54
0.53
0.44
0.38
0.43
□□□
106Q2-
107Q1
□□□ 107Q2
□□□
□□□
107Q3-Q4
□□□□
108Q1

Strategy 4. Extend our rehabilitation intervention during admission



雙和醫院 胸腔內科 COPD 住院標準評估表單_201906 版

床號		姓名		病歷號	
主治醫師		COPD vpn 收案		收案日期	
住院醫師/NP		住院日期		出院日期	

抽菸情形評估

☐ 從未抽菸

☐ 已戒菸：抽菸包數:____（包/天），抽菸年數：___年，戒菸開始時間:_____ 年/_____月

☐ 未戒菸：目前抽菸包數:____（包/天），抽菸年數：___年

執行結果：☐ ___月___日 **轉介戒菸個管師 [請上 007 雙和多團隊系統會診]**

追蹤結果：☐ ___月___日 _____

營養情形

BMI=_____

執行結果：☐ **BMI<21，___月___日會診營養師 [請上 007 雙和多團隊系統會診]**

追蹤結果：☐ ___月___日 _____

用藥情形

☐ 住院期間是否有使用長效型支氣管擴張劑(LABA, LAMA, ICS)（請於出院前開立長效擴張劑並衛教）

執行結果： ☐ 會診病房臨床藥師進行吸入性藥物衛教 **[一般會診]**

☐ 經過衛教，病患技巧佳，不須會診臨床藥師

會診呼吸治療師

☐ 生命徵象與血氧穩定 ☐ 無呼吸道傳染和 3 天無發燒 ☐ 可下床活動如廁，需有照顧者

（上述情形如有不符，須於病床進行肺復原）

☐ 動脈二氧化碳過高→開立"NIV by RT"（BiPAP）

☐ 痰液過多低血氧→"nasal CPAP by RT"（nasal high flow）

☐ 痰液過多→ 開立"HFCWO*5 天 by RT"或"IPPB*3 天 by RT"或"CPT*3 天 by RT"

☐ 呼吸作功增加→開立"NPV*5 天 by RT"（NPV 負壓呼吸訓練）

病歷號： 11638548 床號： 1E20 入院日： 108/07/13

姓名： 施秋森 性別： 男 生日： 032/08/10

主治醫師： 陳資清 病患資訊總表 舊版NIS 新版NIS

LazyR system

11B病房

胸腔內科

2019/07/23 14:00 - 陳資清

Diagnostic Plans： ●血滯氣體 Blood gas
STAT Therapeutic Plans：Acetazolamide 250 mg/tab Dose： 1 Tab TID

2019/07/23 13:30 - 陳資清

2019/07/18 19:30 - 曾健華

2019/07/17 18:30 - 曾健華

2019/07/14 19:00 - 鄭景泉

家庭醫學科

2019/07/15 15:46 - 李欣怡

給予家屬戒菸衛教指導: 1.告知抽菸對身體健康之危害及影響,加強病人戒菸動機 2.給予正向鼓勵及心理支持 3.告知戒菸之好處 4.培養因應緊張、無聊、憂鬱的方法。

2019/07/15 15:44 - 李欣怡

藥劑部

2019/07/23 16:30 - 翁萱容

含類固醇支氣管擴張劑用藥衛教評估 衛教指導對象:本人 本次使用的吸入器為:Symbicort 2puf BID, Spiriva 2puf QD 1.了解使用劑量及頻次 / 了解如何清潔吸入器 / 了解如何觀看藥品剩餘量 / 了解藥品保存環境及效期 / 了解使用吸入劑後須漱口 2.評估使用操作技巧正確

營養室

2019/07/19 19:05 - 米詩宇

訪視日期：2019年07月19日 目前伙食供應種類： 治療餐，種類：軟質 總熱量需求：1645~1794(大卡/天) 營養攝入評估：熱量攝取不足，蛋白質攝取不足 營養衛教及飲食建議：建議飲食處方更改為：半流質飲食 其他：追蹤進食情形

2019/07/19 15:36 - 陳慧丹

2019/07/16 13:13 - 陳慧丹

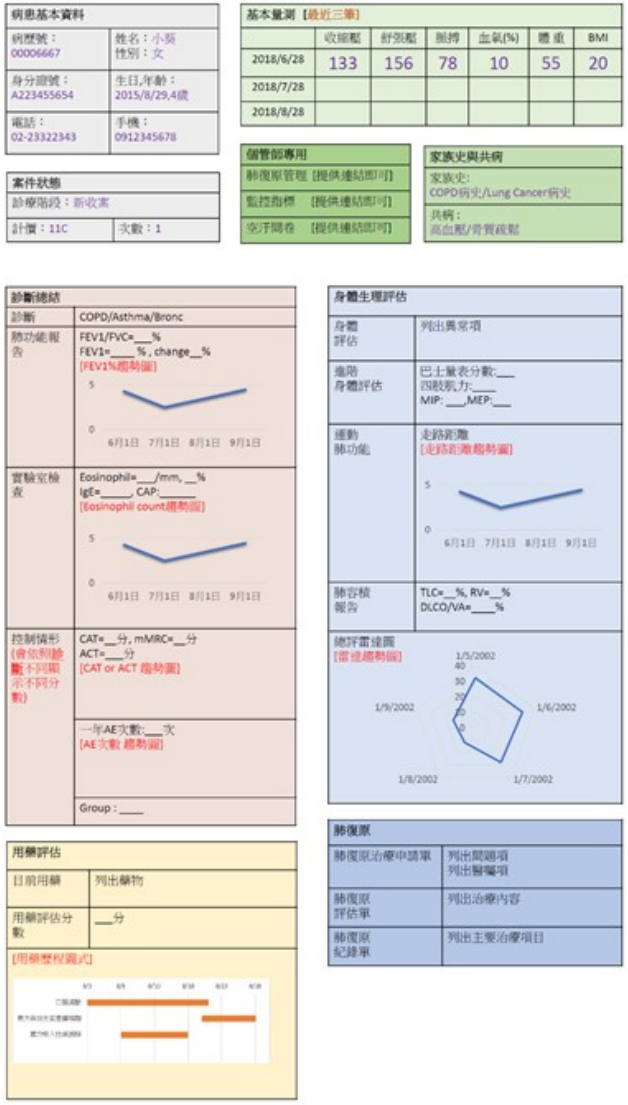
照護紀錄

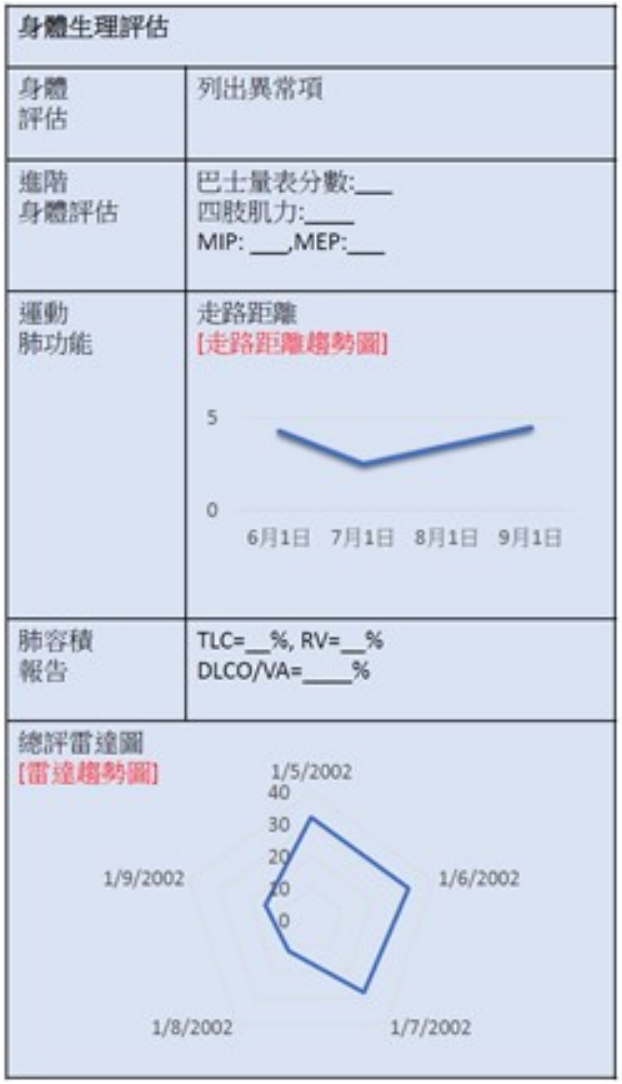
照會科別： (請選擇) 問題類別： (請選擇) 確認

登入者：08015陳淑貞 科別：871B11B病房 職稱：護理長 查看照會訊息 登出

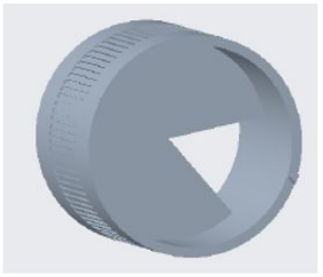
Smoking cessation, Nutrition consultation, Inhaler skill, Rehabilitation

Strategy 5. Data visualization and Structured health record

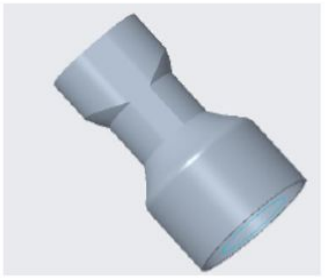


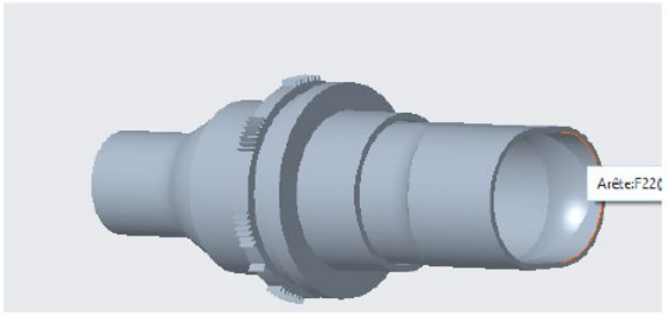


Strategy 6. 3D printing (cheap, individualized training device)



Rotating triangled hole part





Assembled device

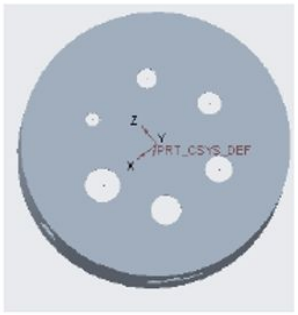


Figure 14 : New version of the multidiameter part [SP]

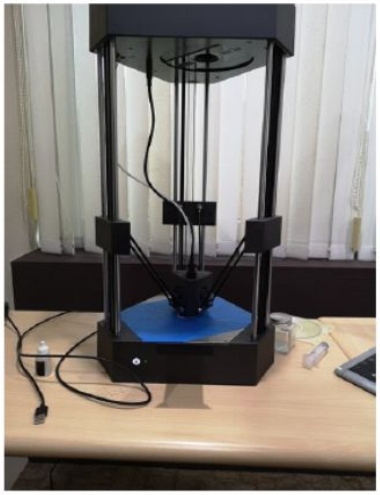
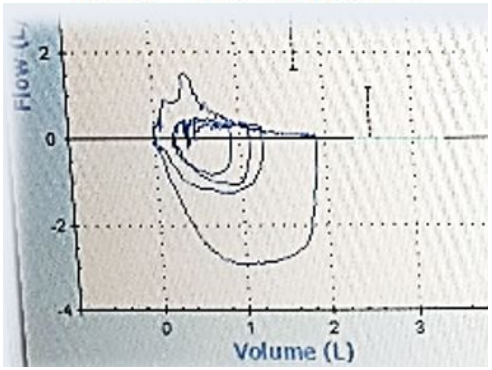
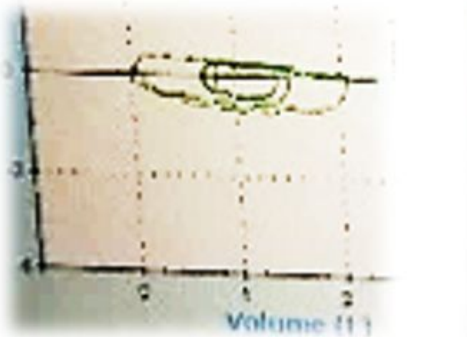


Figure 15 : New design of the prototype in place with ezOxygen spirometer [SP]

Strategy 6. 3D printing (cheap, individualized training device)





Strategy 7. Early diagnosis (local clinics and sensitive spirometer)

大數據中心

計算空汙與生命徵象模式
建立大數據預告警示系統
[北中南]

病患職業暴露(問卷)
醫院、診所AE紀錄

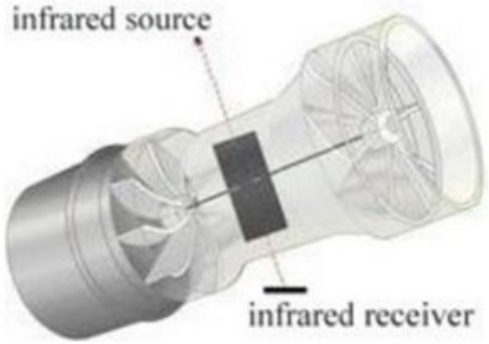
綠色轉診通道
特別門診

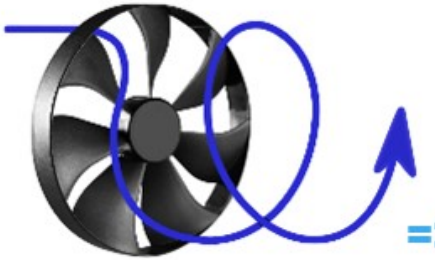
建立轉診網絡資料庫
提供預警系統訊息

基層診所

COPD收案200+人，老人健檢空汙問卷；醫院診所群紀錄AE資料、職業等刺激物暴露 - 流病資料、精準預測

Strategy 7. Early diagnosis (local clinics and sensitive spirometer)





Air flow, Rotating fan

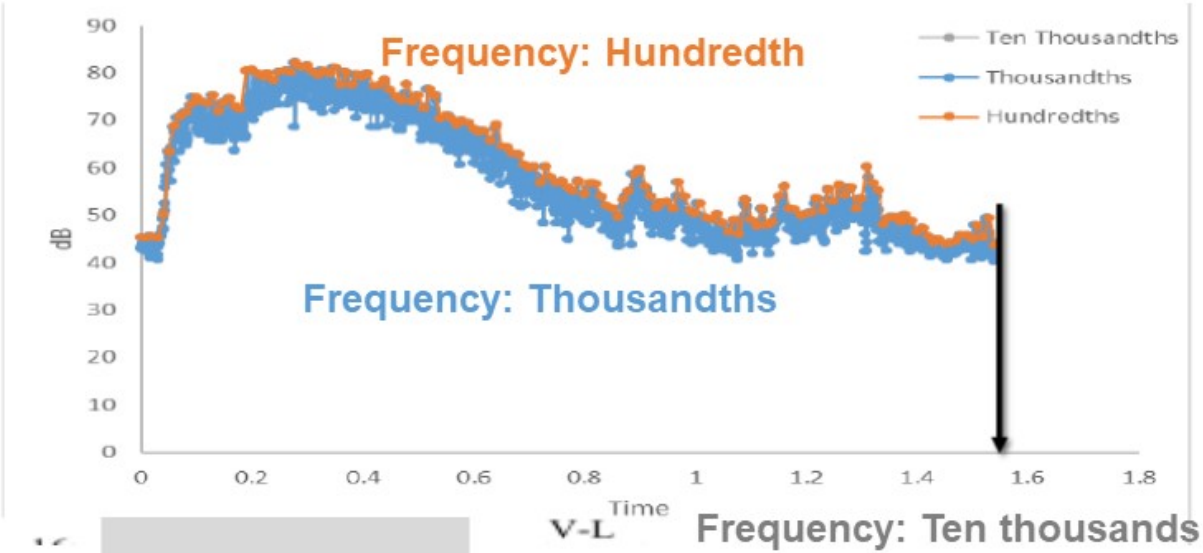
Law of inertia

Smooth curve

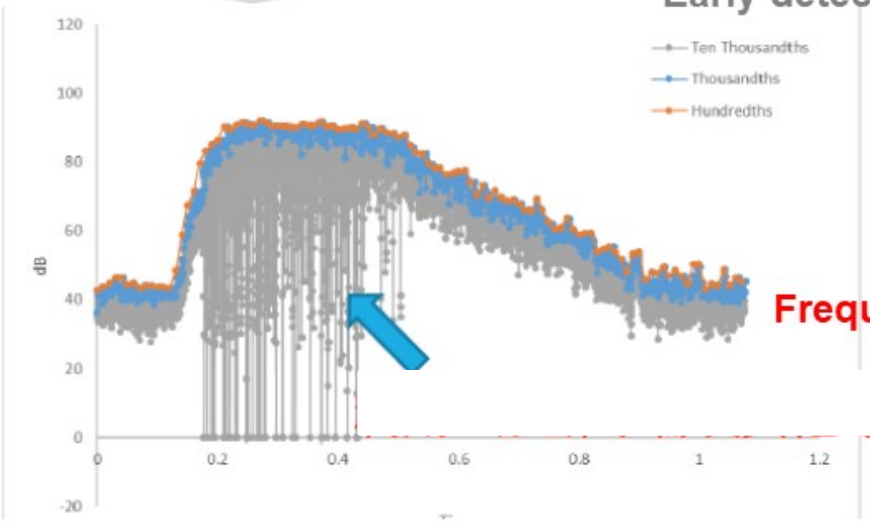
=> Diagnosed airway disease at late stage

Using ultrasonic signals to restore the original physical signals, and collect the big data.

Strategy 7. Early diagnosis (local clinics and sensitive spirometer)



Frequency: Ten thousands
Revealed the detailed airflow changes
Early detection the airway disease

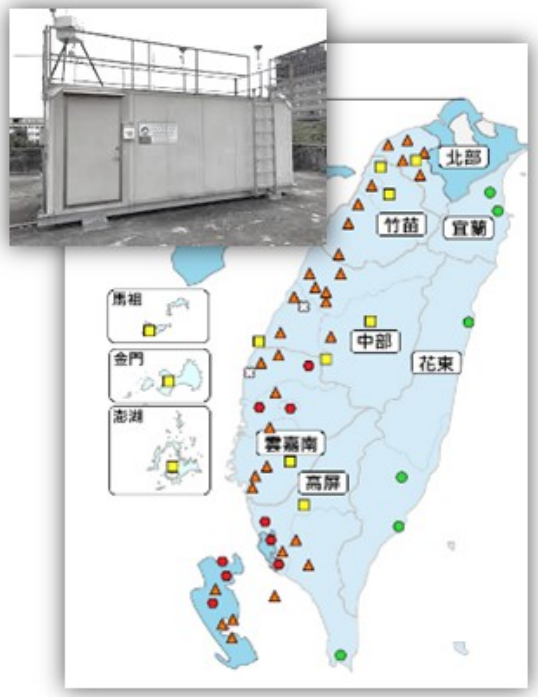


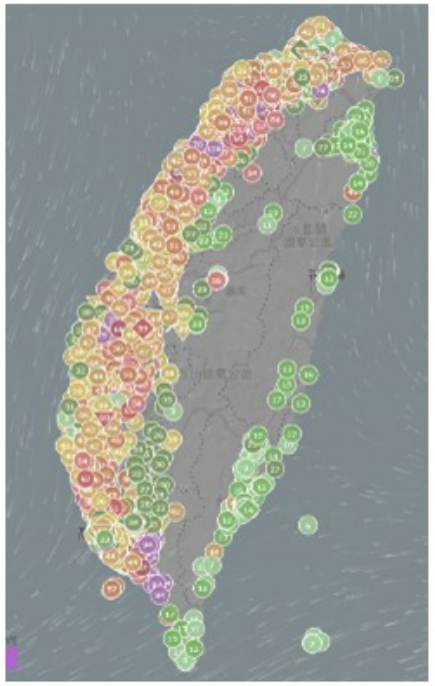
Frequency: Ten Thousandths

Strategy 8. Early prevention (Air pollution detection)

Air quality monitoring station

- Early prevention is always the most important intervention for our patients.
- 76 stations -> 3000 stations in every school, temples and hot spots
- Regional air pollution level not always equal to individual exposure.





https://airbox.edimaxcloud.com/

Strategy 8. Early prevention (Air pollution detection)

Strategy 8. Early prevention (Air pollution detection)

https://www.addwii.com/shop/

Provide the personal air-quality track
Find the “hot spot” for the individual patient

THANKS FOR YOUR ATTENTION!

Strategy 1. Reading group, Monthly case discussion

Strategy 2. Lean healthcare

Strategy 3. Individualized health education and action plan

Strategy 4. Extend our rehabilitation intervention during admission

Strategy 5. Data visualization and Structured health record

Strategy 6. 3D printing (cheap, individualized training device)

Strategy 7. Early diagnosis (local clinics and sensitive spirometer)

Strategy 8. Early prevention (Air pollution detection)

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