How can Watch-PAT adopt the "WIN" strategy

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➢ **Obstructive Sleep Apnea (OSA)** is a common sleep disorder affecting:
  - **2% of middle-aged women**
  - **4% of middle-aged men** in Hong Kong.

➢ **Overnight Polysomnography (PSG**) is the gold standard for the identification and assessment of severity of OSA, nonetheless, it is:

⊖ Labor intensive

⊖ Resource demanding

⊖ OSA patients are usually put on long waiting list

To overcome the problem, a variety of screening tools are designed in order to substitute PSG.

An ideal screening tool should be:

✓ High accuracy,

✓ Cost effective,

✓ Conveniently accessible,

✓ Easy to use, and

✓ With no risks

Watch-PAT
one of the screening tools to design for identifying OSA patients

Study Objective

To explore the effectiveness of Watch-PAT prior to the preliminary impact on the services after implementation of Watch-PAT Loan Scheme at ENT Department.

➢ Sleep apnea is a serious, potentially life-threatening sleep-related breathing disorder that is often linked with heavy snorers.

➢ Commonly, OSA may be triggered by an obstruction in the upper airway

➢ It results in decreasing the amount of inhaled air and disrupting sleep quality.

What is Obstructive Sleep Apnea
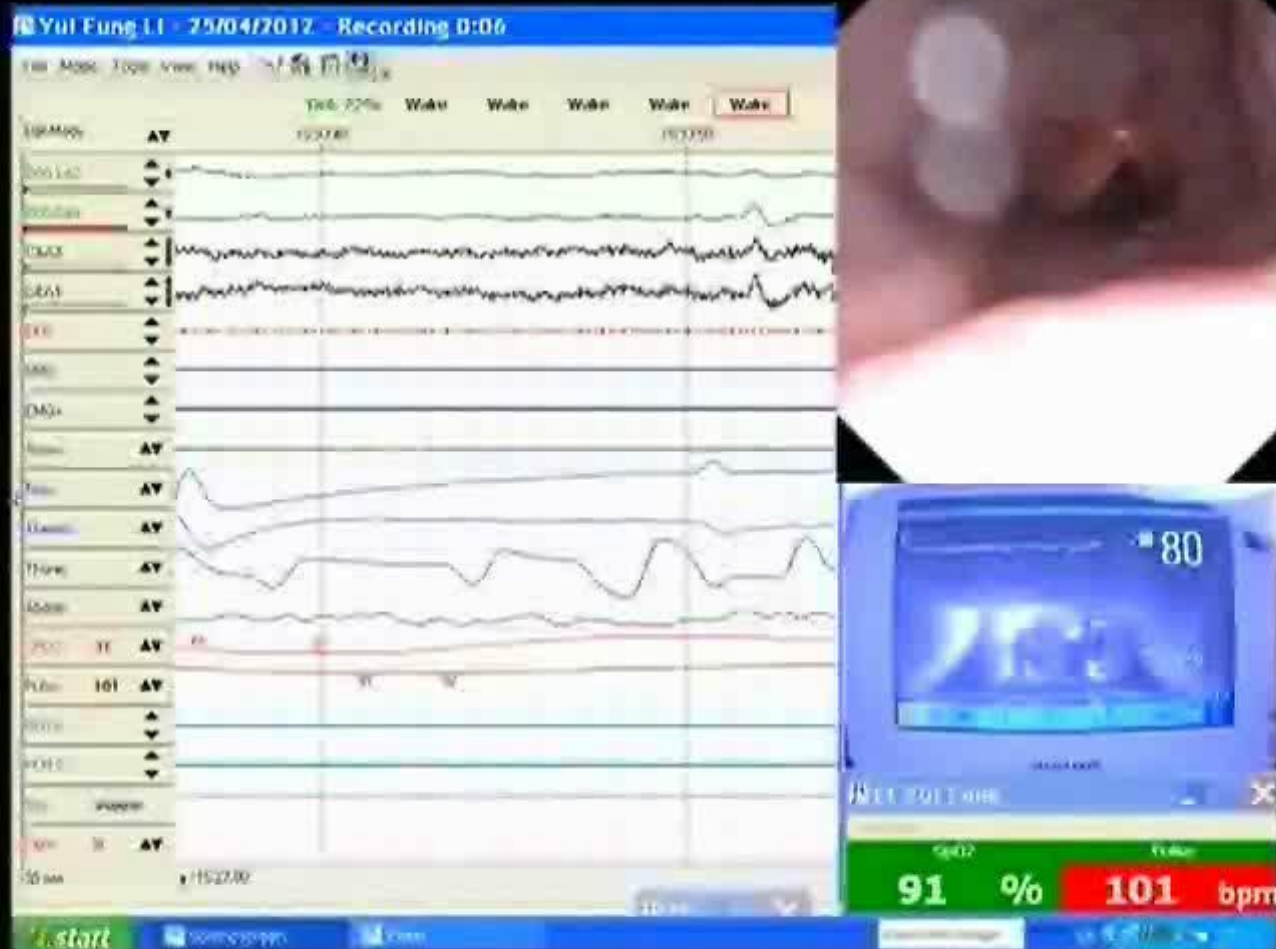
- Watch-PAT is designed to be worn on the wrist like wearing a watch. As a portable and simple wrist-worn machine, Watch-PAT has easy-to-use characteristics.

- Watch-PAT measures **6** channels:

- The machine can generate the sleep report automatically by using Itamar Limited proprietary software. The sleep report shows the following data:

Total Sleep Time

Apnea-Hypopnea Index (AHI)

Pulse Rate Statistics

Snore Level (dB)

Respiratory Disturbance Index (RDI)

Oxygen Saturation Statistics

Body Position

Sleep Stages

- Overnight polysomnography (PSG) is the **gold standard** for the identification and assessment of severity of OSA.

- Full PSG machine has a main device for the storage of all signals:

✓EEG;
✓EOG;
✓ECG;
✓Leg and chin EMG;
✓Nasal/oral airflow by thermistor and nasal cannula;

✓Oxygen saturation;
✓Body position;
✓Thoracic and abdominal movements;
✓Snoring; and
✓Synchronized video recording

- The sleep report can be generated automatically. At Ward 13B (ENT/UCH), manual scoring will be conducted for all sleep study cases by nurses
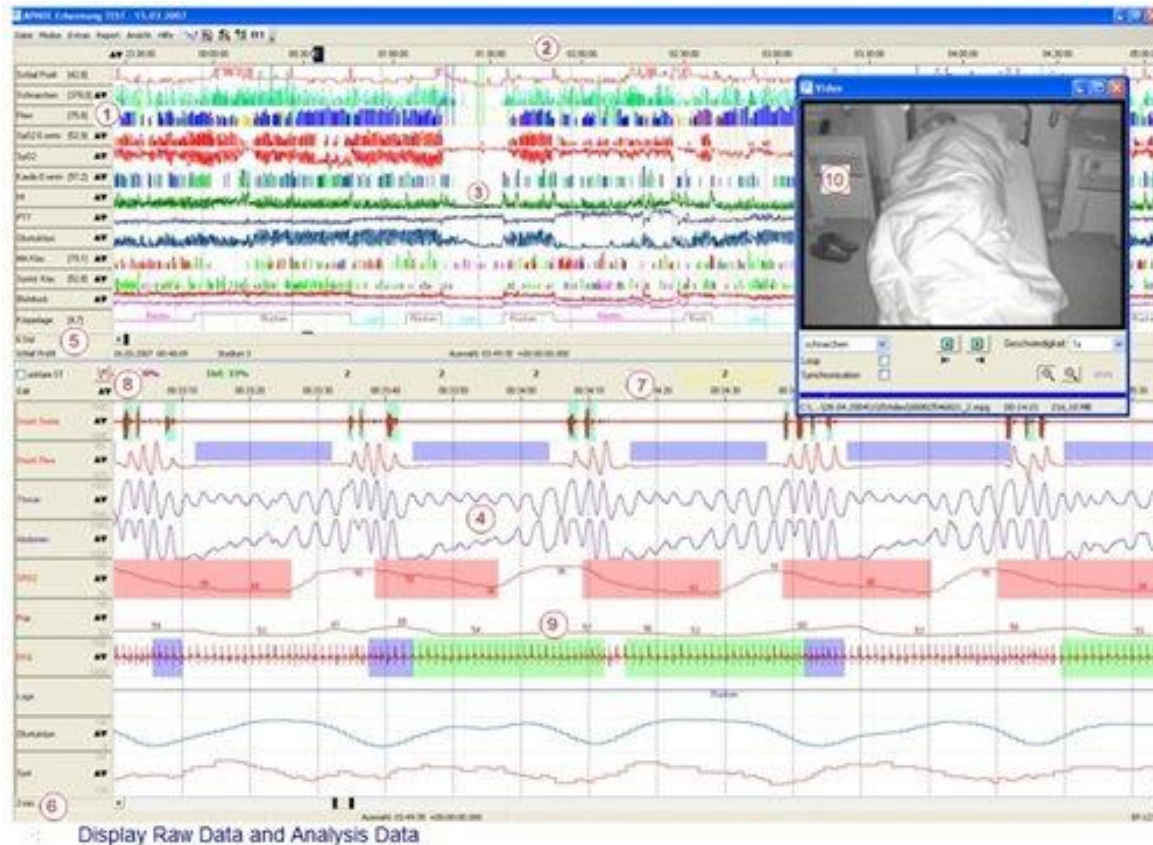
Display Raw Data and Analysis Data

(1) Index per hour
(2) Time Line
(3) Analyses Curves
(4) Raw Data Curves
(5) Time Base Analyses
(6) Time Base Raw Data
(7) Sleep Stages
(8) Show / Compare Sleep Profile
(9) Events
(10) Video Screen

Methodology

Phase ONE:

◆ Investigating the accuracy of Watch-PAT data acquisition alongside a full PSG for OSA patients

Phase TWO:

◆ Exploring the impact of Watch-PAT Loan Scheme at ENT Department

✓ The project was contemplated by the "**WIN**" strategy, THREE elements are:

➢ **W**atch-PAT

➢ **I**npatient

➢ **N**urse

Investigating the accuracy of Watch-PAT data acquisition alongside a full PSG for OSA patients

Watch-PAT → VS ← Somno-medic PSG

- Selection Criteria: Patients with snoring and daytime sleepiness;

- Sampling: 48 patients (38 male vs. 10 female with a mean age of 41.85 and mean BMI of 24.69);

- Method: All of them had a full PSG (Somno-medic) and Watch-PAT (Itamar Watch-Pat 200) on the same night.

- <u>Analyzing</u>: Technologists extracted the results from Watch-PAT (n=48), and scored the PSG study according to the American Academy of Sleep Medicine (AASM) Manual for Scoring 2007.
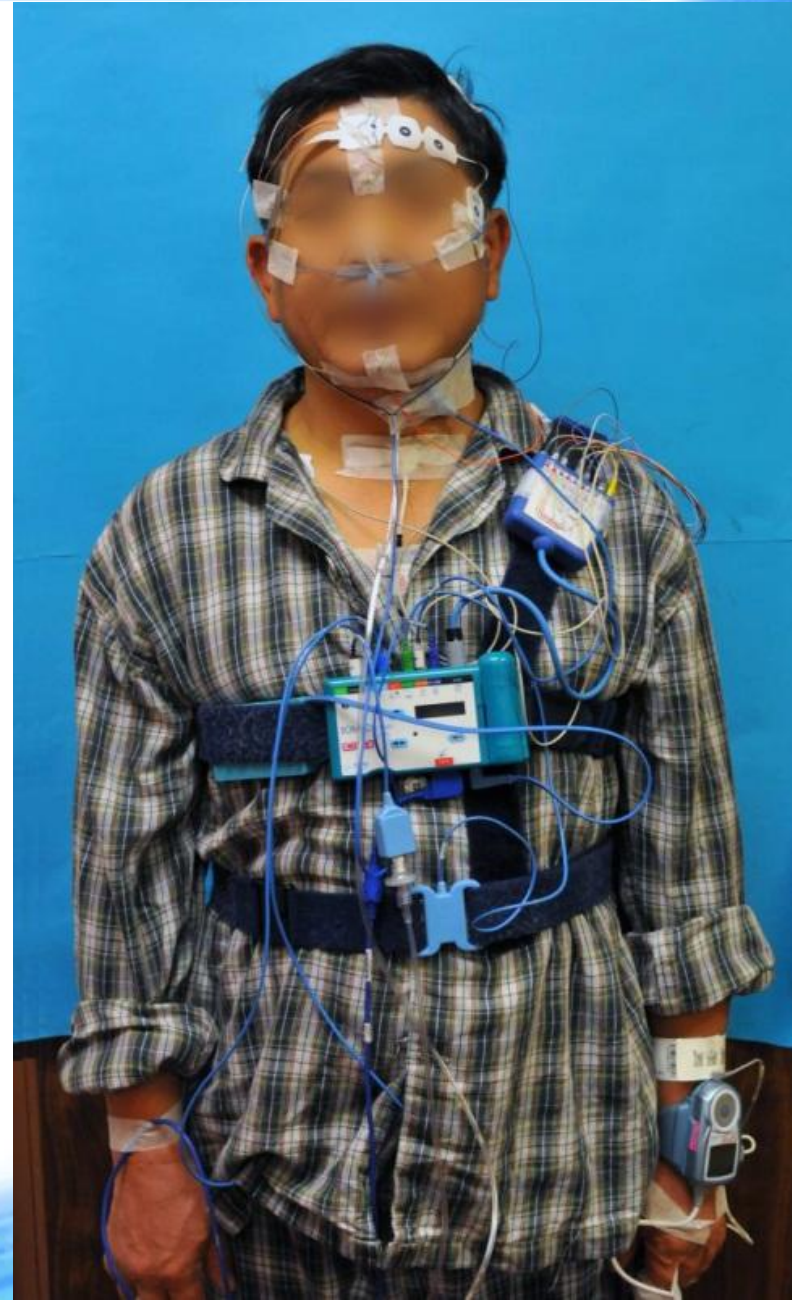
- <u>Measuring</u>: **Mild, moderate and severe OSA** were defined by using *Respiratory Disturbance Index (RDI)** with cut-off value at **5, 20** and **40** respectively;

- <u>Comparison</u>: Categorized the results of Watch-PAT according to the severity; and then compared the results with PSG

*The RDI is the index represents the respiratory events which is recommended measurement for the severity of OSA, by the American Academy of Sleep Medicine (ASSM).

1) Effectiveness of Watch-PAT

- 48 patients (n=48) with daytime sleepiness and snoring were recruited from 2010 to 2012. Both Watch-PAT and full PSG have been undergone on the same night at ward.

Result:

- Average RDIs were 23.11 (PSG) and 27.36 (Watch-PAT) respectively.

- Watch-PAT only slightly overestimates RDI (reflect the severity of OSA) of **4.25** on average ($p < 0.01$).

Cut-offs	Sensitivity	Specificity
RDI=5	100%	9.09%
RDI=20	100%	91.67%
RDI=40	87.5%	87.5%

Table 1 : Sensitivity and specificity of Watch-PAT comparing with gold standard PSG

➢ Watch-PAT demonstrates good reliability as a screening tool for patients with suspected OSA. **100% in sensitivity** indicated all patients with OSA can be recognized.

➢ The specificity=9.09% was the result found in the category of RDI =5 (cases with mild OSA) when comparing with PSG.

➢ However, the specificity reached around 90% when RDI=20 (cases with moderate OSA) and 40 (cases with severe OSA) respectively.

		PSG				Total
		0	1	2	3	
Watch-PAT	0	1	0	0	0	1
	1	9	12	0	0	21
	2	1	1	11	1	14
	3	0	0	5	7	12
Total		11	13	16	8	48

Table 2 : Severity comparison between Watch-PAT and gold standard PSG

0 = No OSA, 1 = Mild OSA, 2 = Moderate OSA, 3 = Severe OSA

Accuracy = $(1+12+11+7)/48 = 64.58\%$

- There was only **1 case** in which Watch-PAT underestimated the severity of OSA when comparing with PSG.

- Other **31 cases** (by Watch-PAT) had the same severity comparing with PSG.

Findings & Outcomes – Data Analysis

➢ In general, it slightly overestimates the severity of OSA in comparison with the gold standard PSG.

➢ Watch-PAT is an effective screening tool especially in detecting moderate to severe OSA patients.

➢ The accuracy of estimating the severity of OSA by Watch-PAT was **64.58%**.

➢ Statistically, it demonstrates good reliability as a screening tool for patients with suspected OSA

➢ It can effectively refer actual OSA patients to admit for PSG whenever necessary.

2) Not Restricted to Inpatient only

Traditional Sleep Study

- Hospitalization
- Inpatient service
- Launched and monitored by nurse

→
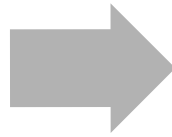
Watch-PAT

- Home
- Self help
- Manipulated by patient
- **Education by nurse**

>>> THE Watch-PAT Loan Scheme is launching at ENT Department

基督教聯合醫院

13B 耳鼻喉科病房

睡眠測試(外借 Watch-PAT)病人須知

借取事項

1. 請攜帶通知書，到本院 S 座 13B 病房辦理有關借取 Watch-PAT 手續。
2. 病人須攜帶身份證親身到取。(18 歲以下人仕，需有成年人陪伴)
3. 由於 Watch-PAT 充電需時，病人到達病房登記後，需等待約兩小時。如病人有急事需離開，請留下聯絡電話號碼，以便病房職員與病人預約日期到取 Watch-PAT。
4. 病人須於借取當晚使用 Watch-PAT，所以 Watch-PAT 不可提早外借。
5. 病人須翌日十二時前交還 Watch-PAT 予病房，如病人沒空可找他人代還。
6. 如 Watch-PAT 借取或交回當日，天文台發出黑色暴雨警告，或懸掛八號或以上的颱風訊號，此項安排會於取消。請於稍後時間致電病房(電話：3513 4480)查詢之後的安排。

### 使用 Watch-PAT 需知

為確保 Watch-PAT 正常運作及避免損壞，請病人留意以下事項：
1. 請依照病房職員指示操作 Watch-PAT，亦可參閱隨儀器附上的指引。
2. 切勿拆掉及按下非指示操作 Watch-PAT 之按鈕或電線。
3. 切勿弄濕 Watch-PAT。
4. 請儘量避免 Watch-PAT 受到碰撞、跌破及受壓。
5. 在睡前才可戴上 Watch-PAT 及啟動儀器。
6. 請確保使用 Watch-PAT 前把手指甲剪短及脫去手上飾物。
7. 請在使用 Watch-PAT 前，確保沒有使用指甲油及潤手霜等。
8. 如有任何問題，請致電病房(電話：3513 4480)查詢。

Watch-PAT 200 使用說明 User Guide

(1) 連接睡眠測試儀之前 Before Putting on the Device

a. 換上睡衣 Dress on your pyjamas

b. 打開 Watch-PAT 存放盒，取出說明書
Open the Watch-PAT carrying case; take out the user guide

c. 把 Watch-PAT 戴在不慣常用的那隻手上
Put the Watch-PAT on your non-dominant hand

* 確保把手指甲剪短及不要搽上指甲油，並脫去首飾及不要使用潤手霜
Make sure the fingernails of that hand is trimmed and without polish; remove all jewelry and avoid using hand cream
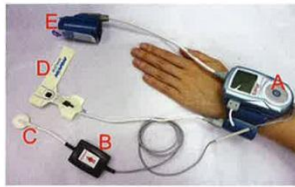
A - 開機掣
ON Button

B - 體位感應器
Body Position Sensor

C - 鼾聲感應器
Snore Sensor

D - 血氧感應器
Oximetry Sensor

E - PAT Probe 感應器
PAT Probe

(2) 安裝鼾聲及體位感應器 Placement of the Snore and Body Position Sensor

a. 把鼾聲及體位感應器從腋下穿過睡衣，移到頸部
Thread the Snore and Body Position Sensor through the sleeve of your pyjamas up to the neck opening

b. 撕開鼾聲感應器底部的膠紙，把感應器黏貼在頸喉下方，以醫療用膠紙加以固定
Peel off the paper of the Snore Sensor, attach it to the base of the neck and secure it in place with medical tape

c. 拿着體位感應器背面膠貼的紙邊，把它拉開，同時把體位感應器黏貼在胸前（胸骨正前方）
Hold the paper tabs on the back of the Body Position Sensor and pull them off the sensor while placing it on the chest bone

d. 連接體位感應器及 Watch-PAT
Connect the Body Position Sensor with Watch-PAT

(3) 安裝血氧感應器 Attach the Oximetry Sensor

a. 把 Watch-PAT 放在桌上，佩戴上並貼好手帶；確保手帶穩固，但不要太緊
Place the Watch-PAT on a flat surface, insert your hand and close the wrist strap; make sure it is locked, but not too tight
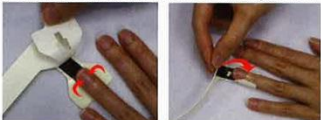
b. 把血氧感應器放在桌上，有文字的一面向下，然後撕開保護膠貼
Place the Oximetry Sensor on a firm surface with the side with writing facing down, then peel off the protective backing
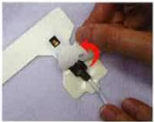
c. 把無名指的指尖放在血氧感應器的中央位置下方
Place the tip of your ring finger just before the mid-line of the Oximetry Sensor

d. 把無名指兩側的膠貼摺上貼好，將血氧感應器往無名指頂部包過去 Fold the side-wings then fold the Oximetry Sensor over the finger

e. 確保上方與下方的黑色部份成直線互相對着
Ensuring that the black protrusions are facing each other

f. 用兩側的膠紙把手指包好，確保不要包得太緊；膠紙上的虛線位要剛置於手指的頂端
Fold down the side-wing, and gently wrap the long flap around your finger, make sure not to wrap the end flap too tightly; ensure the "dotted line" is located at the tip of the finger
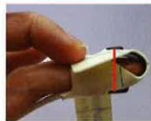
(4) 戴上 PAT Probe 感應器 Place on the PAT Probe

a. 把 PAT Probe 感應器套入食指
Place the PAT Probe on your index finger

* 如食指較粗而未能套入感應器，可選擇其他手指代替，例如尾指
If your index finger is too thick for the PAT Probe, you can choose another finger that fits better, such as your small finger

* 小心選擇，一旦套入並撕去膠紙，就不能轉換到其他手指
Choose carefully, once in place, the PAT Probe cannot be removed and placed on a different finger

b. 把食指插進感應器的最末端，有 TOP 字條的一面應向著食指上方，有 BOTTOM 字條的一面應向著食指下方
Insert your index finger all the way into the PAT Probe. The tab labeled TOP should be situated at the top side of the finger, and the tab labeled BOTTOM should be on the underside

c. 慢慢撕去頂部和底部的膠紙，小心不要扭轉感應器
Gently and firmly remove both paper tabs; be careful not to twist the PAT Probe

(5) 啓動 Watch-PAT Turn on the Watch-PAT

a. 睡在床上，用力按着 Watch-PAT 上的圓形開機掣鍵數秒，直至見到屏幕出現 "Itamar Medical" 文字
Get into bed, and press firmly on the round ON button for a few seconds until you see "Itamar Medical" on the LCD screen

b. 30 秒後，屏幕中央會出現 "Good Night" 字樣，表示開始睡眠測試
After 30 seconds, a "Good Night" in the middle of the screen indicates the study has started

c. Watch-PAT 操作正常，現在可以入睡了
Watch-PAT is now working properly, and it is time to go to sleep

* 如發生問題，屏幕會顯示 "TEST ABORTED" 測試中止，此時請記下所顯示的 "ERROR CODE" 問題編碼，並致電尚健緊急傳呼 8209 1111
If there is a problem, you will see "TEST ABORTED" ; note the "ERROR CODE" and call Celki emergency call 8209 1111

(6) 睡眠測試翌日 The Day After Sleep Test

a. 除去 PAT Probe 感應器、血氧感應器及儀器
Remove the PAT Probe, Oximetry Sensor and the device

b. 把所有儀器、感應器及說明書放回 Watch-PAT 存放盒裡
Place the device along with the PAT Probe, Oximetry Sensor and the user guide back to the Watch-PAT carrying case

* 此睡眠測試儀無須關閉電源，紅色顯示燈會一直亮着，這是正常的
Watch-PAT cannot be turned off, a red light will glow from the Oximetry Sensor. This is normal.

如你依照以上的步驟，就可以成功使用 Watch-PAT 進行睡眠測試
If you follow the steps presented here carefully, you should have a successful Watch-PAT sleep diagnostic test.
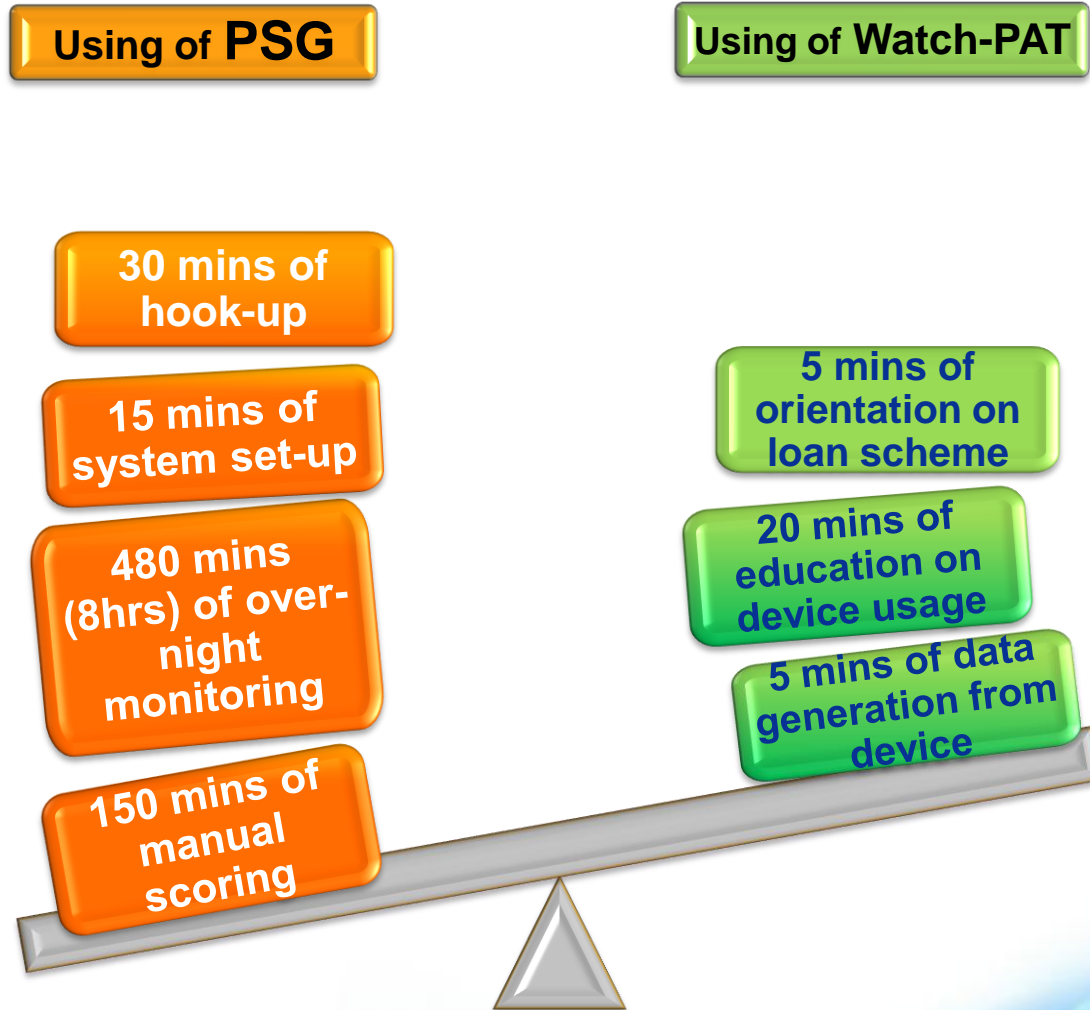
Findings & Outcomes:

- 30 cases (in 5-month) were participated in the Watch-PAT Loan Scheme.

- It significantly shortened the patient waiting list for sleep study from **6-12 months (PSG)** to **within 1 month (Watch-PAT)**.

- On the other hand, more beds can be relieved to accommodate for the huge demand, i.e. Emergency or Post-operative cases resulting in better resources allocation.

3) Relieve workload of frontline Nurse

Using of PSG

Using of Watch-PAT

30 mins of hook-up

15 mins of system set-up

480 mins (8hrs) of over-night monitoring

150 mins of manual scoring

5 mins of orientation on loan scheme

20 mins of education on device usage

5 mins of data generation from device

Total consumption of using PSG

675 mins of nursing manpower + 1 overnight bed

Resources saved from One patient

= 645 mins of nursing manpower
+
1 overnight bed

Total consumption of using Watch-PAT

30 mins of nursing manpower

>>>Nurses spend relatively plenty of time on inpatients in order to maximize the quality and safety of services.

- High sensitivity of Watch-PAT indicated patients with OSA can be recognized. Obviously, it is **useful screening tool to detect OSA**.

- Both patients & nurses get benefit from the **Watch-PAT Loan Scheme**.

- **Win-win situation** is accomplished by the project.

- Findings drop hints for better resources allocation:

Enhancing the **W**atch-PAT

Loan Scheme

Not restrict to **I**n-patient only

Minimizing the workload of **N**urses

"WIN" situation is accomplished

Reference

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