

Telemedicine

for postoperative rehabilitation

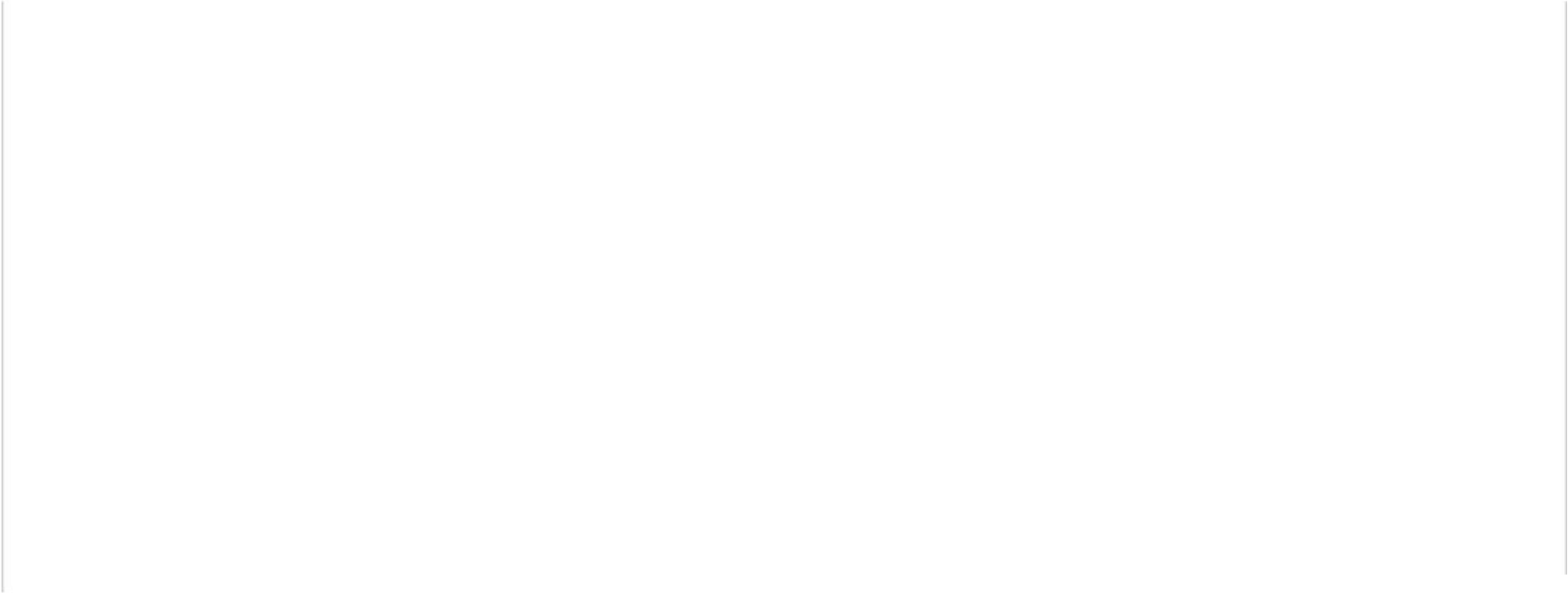


劉權緯 Ian Liu, PT, MS
PTC, NCKUH



Share of all Medicare beneficiaries living in the community with a usual source of care (52.7 million beneficiaries):

Yes No Don't Know



Rapid adoption in response to COVID-19

Before COVID-19:

18%

of doctors delivered virtual care

After COVID-19:

48%

of doctors are delivering virtual care

"Survey: Physician Practice Patterns Changing As A Result Of COVID-19,"
Merritt Hawkins press release, April 22, 2020.



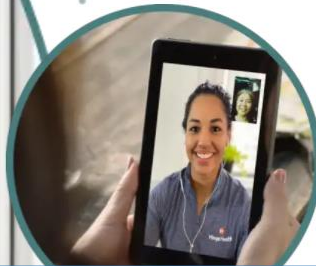


Hinge health



Physicians & Orthopedic Surgeons

Managing clinical programs and Expert Medical Opinion



Licensed Doctors of Physical Therapy

Creating and delivering personalized care plans

Ortho Doctor

Physical therapist

Plan/Video



3 benefits of Telemedicine for postoperative rehab

**Increased
patient
utilization**

Unable to return for a variety of reasons
COVID-19
Distance
Cost effect

**Improved user
experience**

Different surgical methods
Accident after operation
Different life goals

**Remote patient
monitoring**

Collect data
Motion analysis
Compliance



安膝 智慧感測器

讓動作做正確

AI knee brace for ACLR

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Increased patient utilization

KNEESUP Med

蘇維仁
醫生

首頁

病患管理

復健計畫庫

v1.8.2

2022/6/21

病患管理

搜尋病患

待處理

尚無待處理的病患

進行中

林宇
● ● ●

陳彥
● ● ● ● ● ● ● ●

盧芳
● ● ● ● ● ● ● ●

PingH uChi
● ● ● ● ● ● ● ●

吳勳
● ● ● ● ● ● ● ●



陳彥
35歲 · 男 · 左膝 · 前十字韌帶重建

概要

基本資料

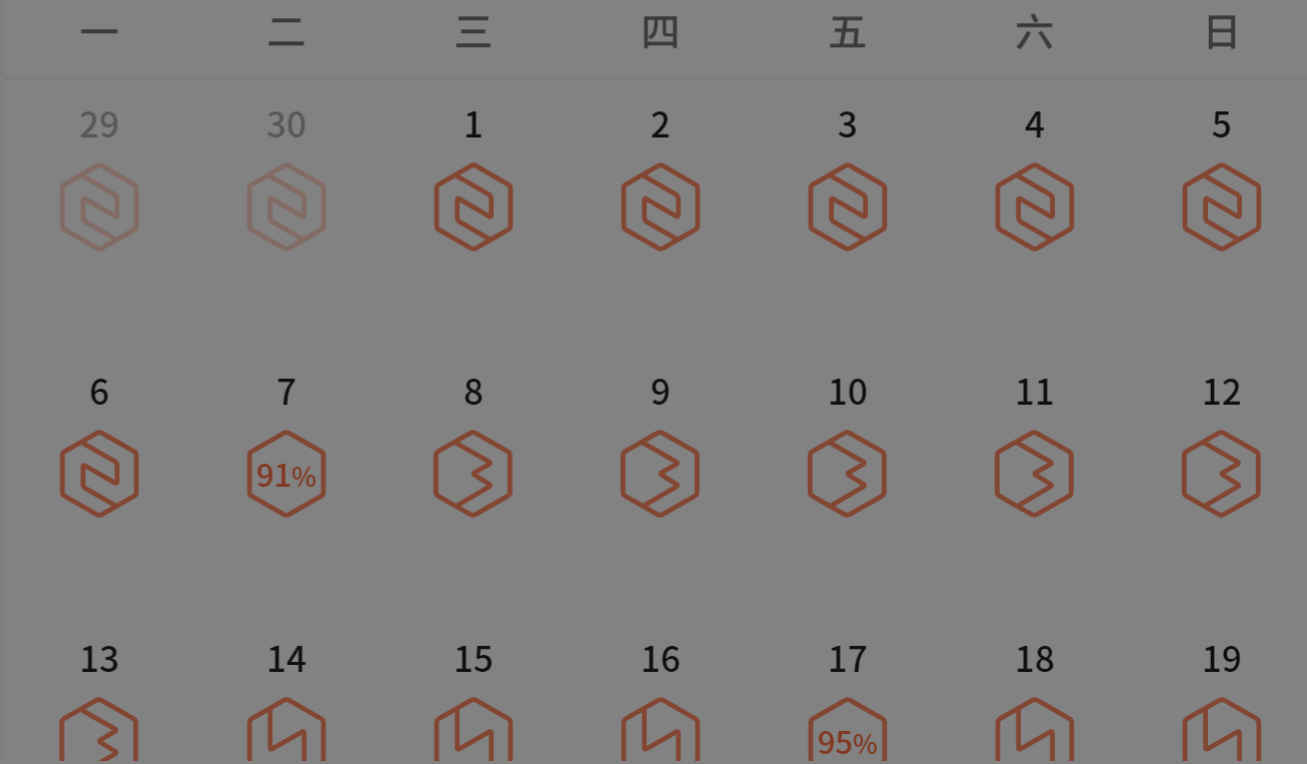
每日動作

復健計畫

活動紀錄

自覺量表

< 2021年12月 >



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Improved user experience

醫囑

 蘇維仁 醫生

手術後到全面活動，一般需時 9~12 個月。

透過復健運動，達到膝關節彎曲伸直活動度，肌力，平衡能力，以及功能性的恢復，才能逐漸重回日常活動。而回歸運動場，則必須進行一定的訓練，並通過回歸運動測試後，方可安全的進行運動及比賽。

適當的復健運動對手術後病患功能的恢復有決定性的影響。請依照建議，執行十字韌帶術後的復健計畫，將有助於您較快且安全的復原。

復健計畫表



等級 1

第 1~2 週：2021/11/4 ~ 11/18



目標活動度：0° ~ 0°



等級 2

第 3~4 週：2021/11/19 ~ 12/6



目標活動度：0° ~ 60°



等級 3

第 5 週：2021/12/7 ~ 12/13



目標活動度：0° ~ 90°

Improved user experience

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陳彥
35歲 · 男

歷史報告

每日做 2 輪
每輪動作相同

第 1 輪 ⌚ 36 分
共 12 項，動作間隔休息 1 分鐘



被動加壓膝關節伸直

★ 3 級 ⌚ 5 分 * 需感測器



主動彎曲腳跟滑動

★ 1 級 ⌚ 3 分 * 需感測器



髕骨鬆動: 向上

★ 2 級 ⌚ 1 分

動作

復健計畫

活動紀錄



等級 3

第 5 週 : 2021/12/7 ~ 12/13

目標活動度 : 0° ~ 90°



等級 4

第 6~7 週 : 2021/12/14 ~ 12/27

目標活動度 : 0° ~ 110°



等級 5

目前階段

第 8~9 週 : 2021/12/28 ~ 2022/1/10

目標活動度 : 0° ~ 120°



等級 6

下一階段

第 10~11 週 : 2022/1/11 ~ 1/24

目標活動度 : 0° ~ 120°

v1.8.2

2022/6/21

每個人的身體狀況不同，恢復進度也會不同，請勿躁進

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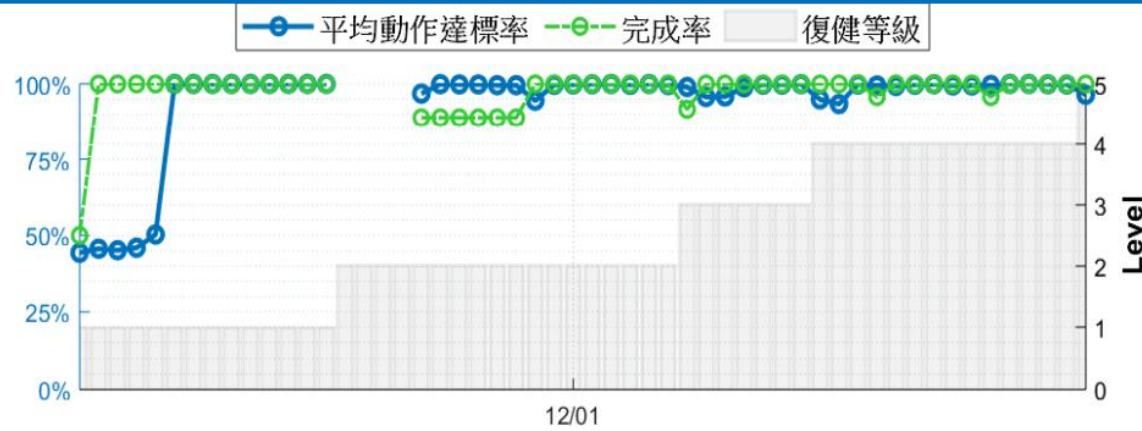
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Remote patient monitoring



Compliance



Bridge with single leg

預覽動作



臀橋單腳承重

Bridge with Single Leg Weight Bearing

★ 2 ⌚ 2分30秒 ✳ 需感測器

動作感測

感測器提示會幫助病患達到最佳動作

未達 門檻 達標 門檻 未達

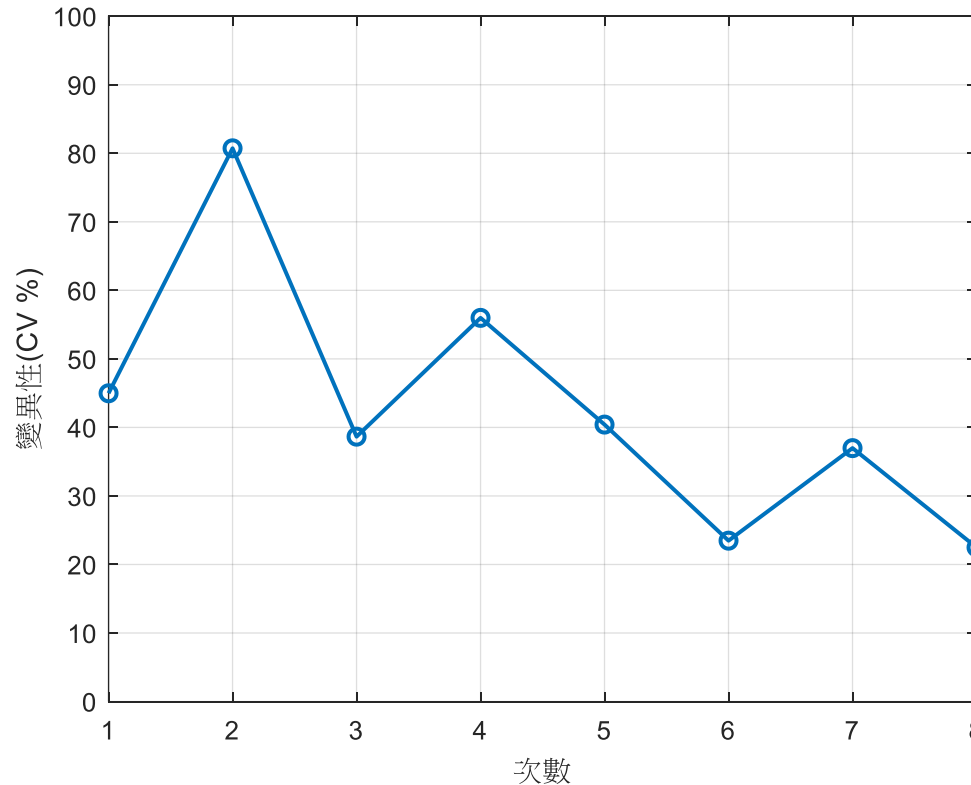
目標

組數 1組

次數 8下

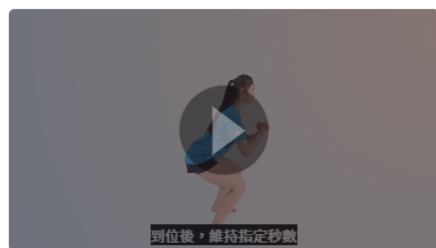
每下維持時間 10秒

說明：計算臀橋臀部抬起時的晃動程度(變異性 = 標準差/平均)



Count	變異性(%)	Knee ROM
1	44.98%	86.48
2	80.72%	80.96
3	38.65%	89.44
4	55.98%	85.95
5	40.41%	87.64
6	23.47%	83.87
7	36.98%	92.78
8	22.49%	84.51

Squat



深蹲

Squat

★ 2 ⌚ 2分25秒 * 需感測器

動作感測

彎曲到 90 ~ 100° 之間時，動作最佳



目標

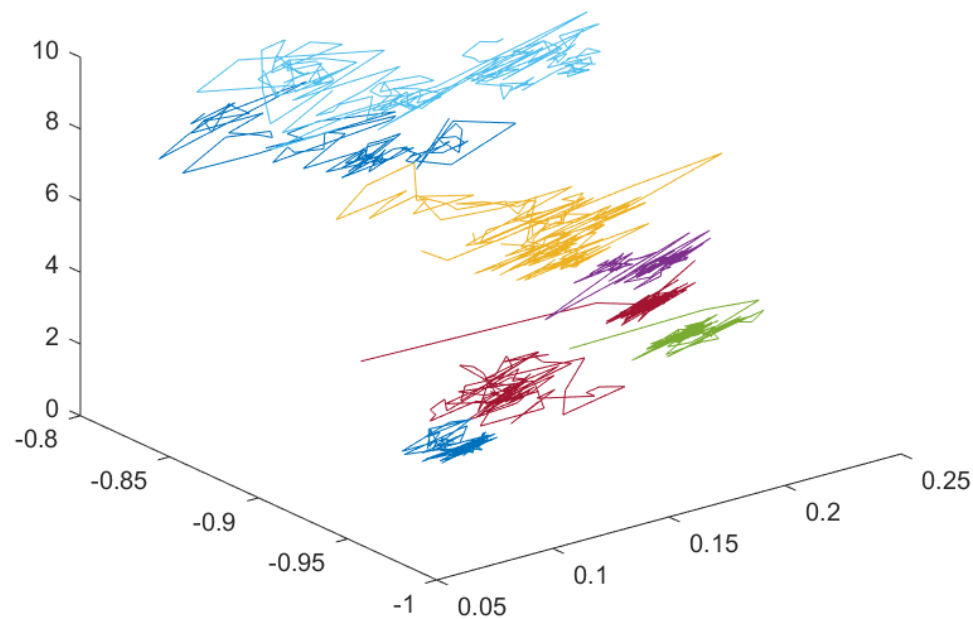
彎曲角度 90度

組數 1組

次數 10下

每下維持時間 10秒

說明：計算深蹲超過門檻時的晃動程度



Item	Value
平衡範圍	0.004
AP	0.0563
LM	0.1028
Knee ROM	90.42

**A novel home-based rehabilitative knee brace system is a
viable option for postoperative rehabilitation after the
anterior cruciate ligament reconstruction**

Chih-Kai Hong^{1,2} MD, Zhao-Wei Liu³ PT, Kai-Lan Hsu^{1,2} MD, Fa-Chuan Kuan^{1,2}

MD, PhD, Jeng-Feng Yang^{3,4} PT, PhD, Wei-Ren Su^{1,2,5} MD, MSc

MOST are achieved TKE within the FIRST month

Table 2. The demographic information and the knee joint range of motion of each patient

Patient No.	Gender	Age	Laterality	Preoperative AROM	Preoperative PROM	6 months post-OP AROM	6 months post-OP PROM	Time to reach full knee extension (month)
1	Female	26	Right	0-150	0-155	0-150	0-155	3
2	Female	21	Left	5-70	5-75	0-130	0-130	1
3	Male	22	Right	0-110	0-120	0-121	0-130	1
4	Male	30	Right	0-130	0-142	0-122	0-145	1
5	Male	24	Right	10-140	0-145	0-135	0-140	3
6	Male	42	Right	0-120	0-134	0-115	0-130	1
7	Female	30	Left	0-32	0-46	0-96	0-100	1
8	Male	30	Right	0-128	0-140	0-122	0-132	3
9	Female	41	Left	0-126	0-130	0-120	0-126	1
10	Male	21	Left	0-140	0-143	0-140	0-146	1
11	Female	28	Left	0-120	0-124	0-138	0-142	1
12	Male	31	Left	0-114	0-124	0-120	0-140	1
13	Male	24	Left	0-132	0-146	0-140	0-146	1
14	Male	33	Left	0-120	0-126	0-130	0-130	1
15	Male	21	Left	6-126	2-132	0-130	0-135	3

AROM, active range of motion; PROM, passive range of motion

Recover to pre-op state

Significant improvement on function after 6 mths

IKDC Scores

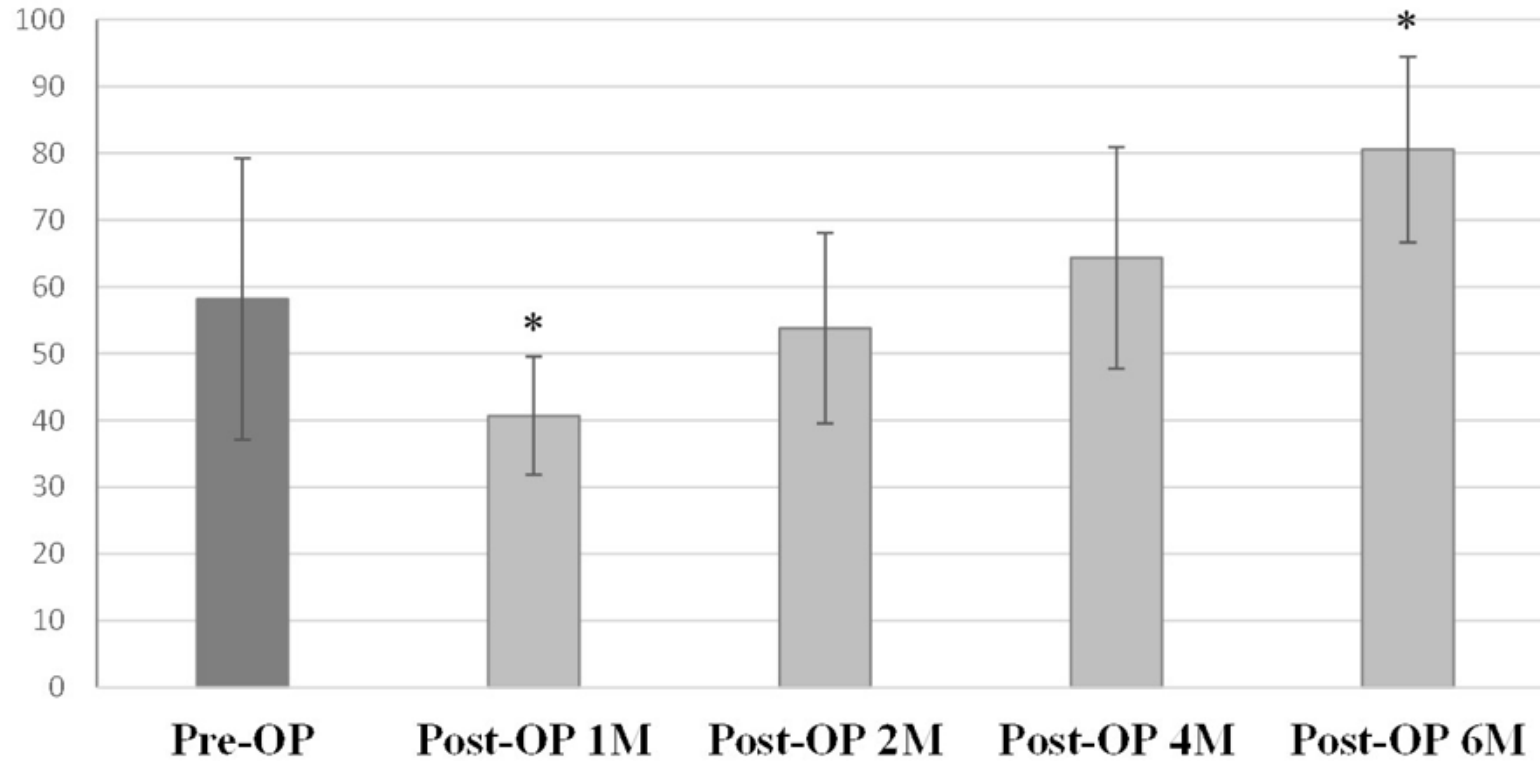


Fig. 5: The International Knee Documentation Committee (IKDC) score at preoperative day and postoperative 1, 2, 4 and 6 months. * indicated significantly difference between the preoperative and postoperative scores ($p < .05$).[↵]

Patient overall compliance to physiotherapy is low

70%

Of patients will not comply with exercises as prescribed

14%

Of patients will not return after one visit

While the benefits of physiotherapy or physical activity are well known, they can be difficult to follow for an individual

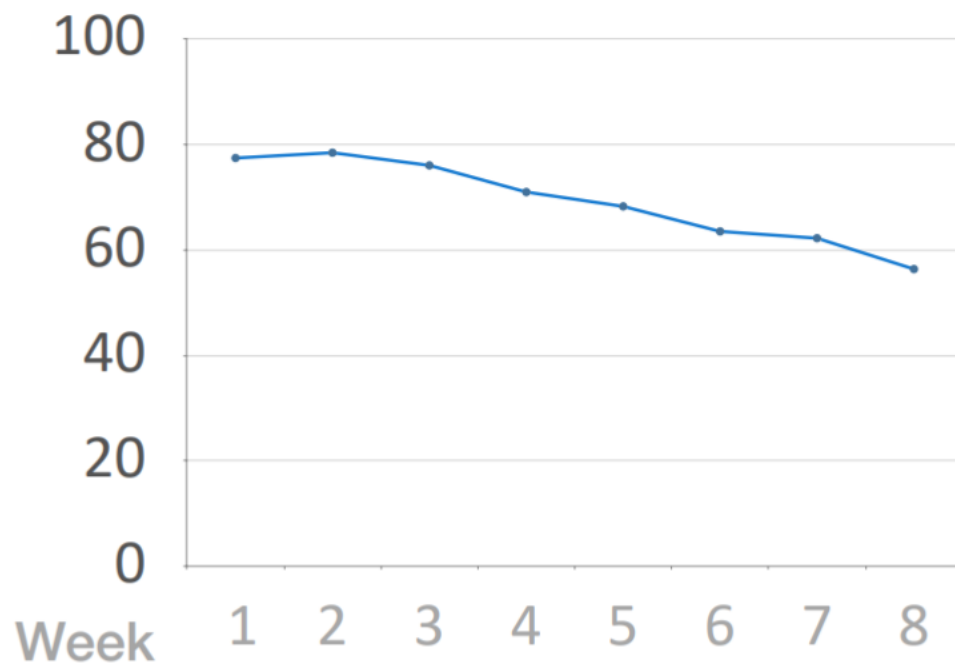
<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2923776/>



69.2%

每日平均完成率

所有用戶，術後 8 週



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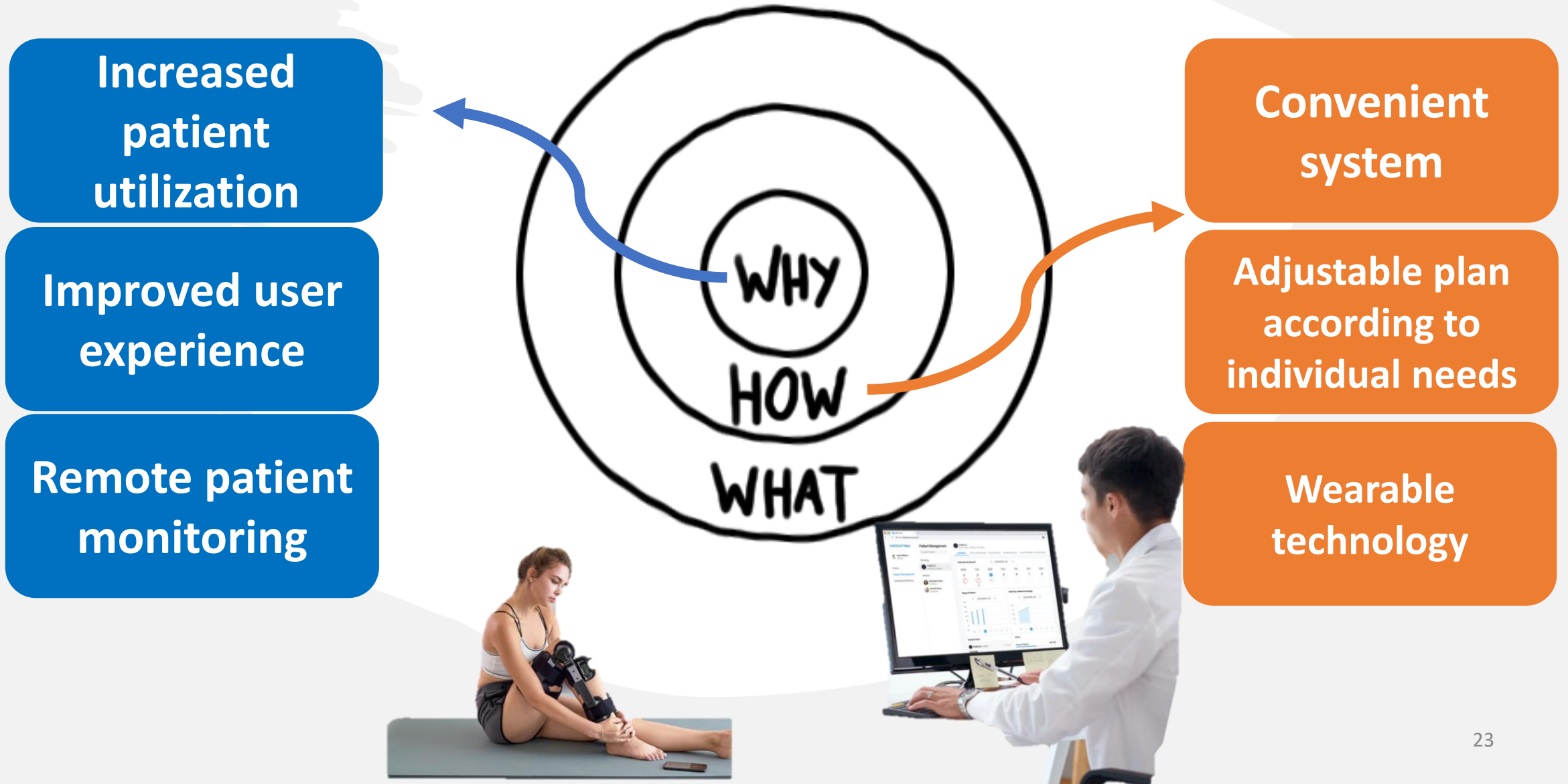
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GORDEN CIRCLE OF TELEMEDICINE





Thank you
for your attention

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