



Kaohsiung Medical University Hospital, Kaohsiung Medical University  
(Kaohsiung Medical University Chung-Ho Memorial Hospital)

# The benefits of data visualization on operational decision-making

-Using ophthalmology as an example.

Chiao-Wen (Kate) Chang

2024.11.08



International Network of  
Health Promoting Hospitals  
& Health Services



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# About Me, Chiao-Wen Chang, RN, M.S. 張巧玟

Department of Operation Management, Kaohsiung Medical University Hospital, Kaohsiung Medical University



## • Current position : Clinical Manager

## • Special Honor Within three years

- April 2022 – September 2022 **Japan Student Services Organization (JASSO) Scholarship winner.**
- September 2022 – **Outstanding paper award** by The Journal 「Hospital」. Topic: *Physicians' perspective of prevention strategy of Taiwan hospital center on COVID-19.*
- June 2023 – **First place** of **Artificial Intelligence management project** on 2023 in KMHU alliance hospitals.
- August 2023 – Taiwan Healthcare Quality Association – **Excellent in Article Award** Nominee.
- March 2024 – **First place** of **Artificial Intelligence management project** on 2024 in KMHU alliance hospitals.

## • Expertise

- Management accounting 、 Financial Performance 、 Surgical Nursing 、 Geriatric Nursing
- Patient flow Management 、 Data Visualization 、 Artificial Intelligence project management



e-business card



# The benefit and application of DV.

- **Data visualization(DV) is crucial in today' s data-driven business world**, which has been widely used for helping decision making that is closely related to **major revenues** of many industrial companies (Qin, Luo, Tang, et al. 2020).
- Through data analytics, these tools enable **healthcare providers** to make informed decisions that can lead to **cost savings and operational improvements** (Nwosu, 2024).
- **Cotter (2024)** created DV dashboards **on flu vaccinations**. The result shows 『**The flu dashboards**』 significantly increased perceived susceptibility to the flu compared to the control group ( $P = .049$ ).



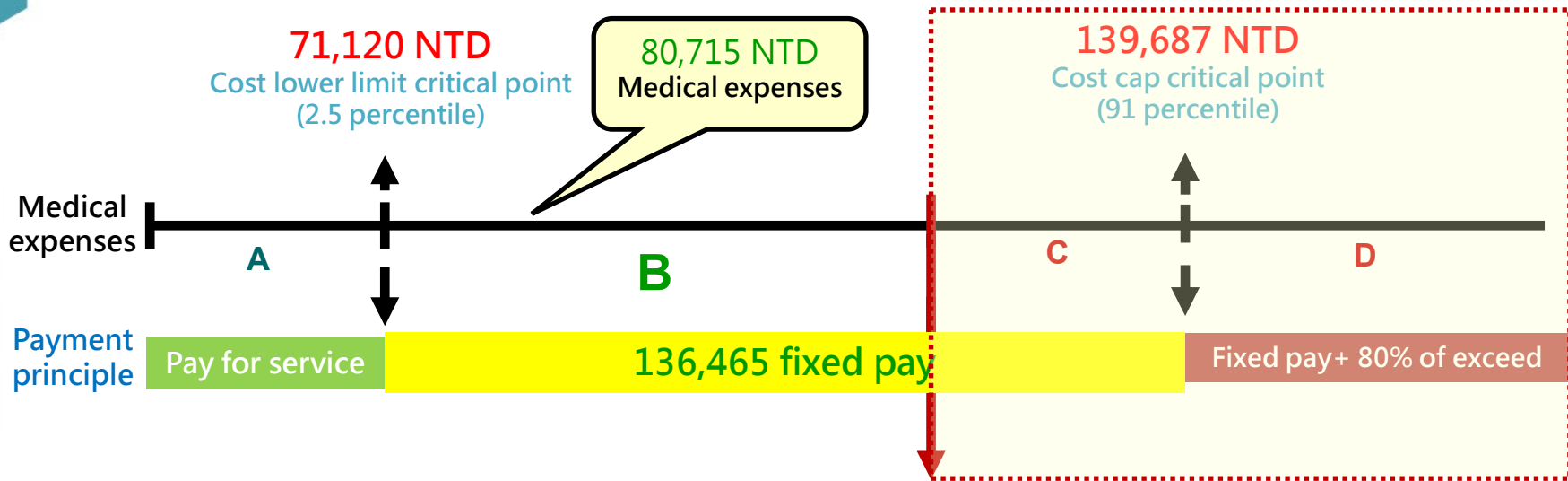
# Research objective

- Few researches are focused on the benefits of DV on operational decision-making in medical industrial.
- This study aims to provide physicians with comparisons among peers of their medical decision.
- We primarily focus on **the Taiwan Diagnosis Related Groups (TW-DRGs) cases** in the **ophthalmology** department.
- **TW-DRGs payment system** categorizes inpatients into different groups based on factors such as **diagnosis, surgery or treatment, age, medications or complications** and so on.
- **Taiwan : TW-DRGs 、 The United States : MS-DRGs 、 Japan : DPC.**



# What is the TW-DRG payment system?

Example: TW-DRG Code 11202\_Percutaneous Coronary Intervention (PCI) on a Single Vessel



$$136,465 \text{ fixed pay} = \text{Relative Weight} \times \text{Standardized Payment Rate} \times$$

(1 + Basic diagnosis and treatment bonus rate 7.1% + Pediatric bonus rate + CMI bonus rate)



# Methods

- Since April 2023, we created an "**Ophthalmology TW-DRGs dashboard**" to enhance physicians' responsibilities for saving medical expenses.
- We initiated monthly meeting to sharing **each** physician's medical expenses of TW-DRGs.
- We explored the reasons for **high-expenses cases** within the same DRGs. A paired t-test was used to analyzed the expenses and payments into two parts based on the month of dashboard creation (before and after DV implementation).



# Before Data visualization-1

Number of cases  
 Medical expenses  
 Payments by TW-DRGs  
**Profit =  
 Payments minus expenses**

|              | 201812 | A       | B      | C       | D       | 總計   |
|--------------|--------|---------|--------|---------|---------|------|
| 個案數          | -      | 6       | 1      | 9       | 16      |      |
| 醫療費用         | -      | 192,649 | 28,278 | 287,079 | 508,006 |      |
| 申報費用         | -      | 236,862 | 27,062 | 269,441 | 533,365 |      |
| 損益           | -      | 44,213  | -1,216 | -17,638 | 25,359  |      |
| <b>KPI指標</b> |        |         |        |         |         |      |
| 1. CD區件數占率   | -      | 38%     | 6%     | 56%     | ●       | 63%  |
| 2. 申報比值      | -      | 1.23    | 0.96   | 0.94    | ●       | 1.05 |
| 3. CMI值      | -      | 0.86    | 0.59   | 0.59    | ●       | 0.69 |
| 4. 住院天數      | -      | 1.83    | 3.00   | 3.11    | ●       | 2.63 |

The percentage of C/D cases

The ratio of payments/expenses

The Case Mix Index

Length of stay

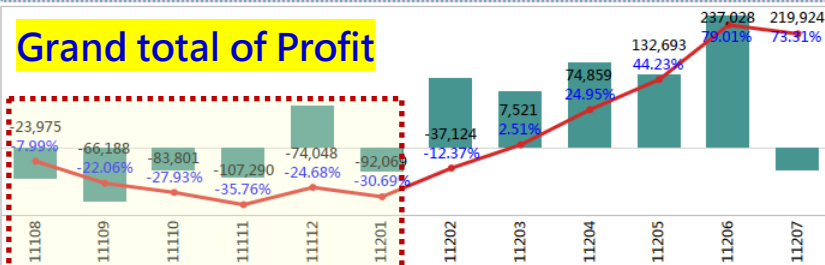


# 2023-Ophthalmology TW-DRGs dashboard

## 1. 全院\_TW-DRGs 各指標執行狀況 (同期比)

| 110. 111. | 個案數 | LOS | 醫療費用合計    | DRG支付點數   | 差額      | 申報比值 | CD區個案數 | CD區佔率 |
|-----------|-----|-----|-----------|-----------|---------|------|--------|-------|
|           | 157 | 1.9 | 5,709,299 | 5,929,223 | 219,924 | 1.04 | 102    | 68.0% |
|           | 112 | 1.8 | 3,853,883 | 4,101,731 | 247,848 | 1.06 | 69     | 62.7% |

## 2. 眼科部\_TW-DRGs 累計差額 (目標值：300,000)



## 4. 各醫師TW-DRGs 年總計差額

|     |         |
|-----|---------|
| 邱子瑜 | 62,620  |
| 曾漢儀 | 61,552  |
| 李學宇 | 55,598  |
| 劉沛綱 | 40,876  |
| 林憲忠 | 35,545  |
| 吳弘鈞 | 34,220  |
| 鄭凱駿 | 2,896   |
| 許淑娟 | 2,605   |
| 徐旭亮 | 1,038   |
| 李柏延 | -920    |
| 賴昱宏 | -5,802  |
| 林佳靜 | -15,611 |
| 賴泓吉 | -16,186 |
| 張祐誠 | -18,030 |
| 邱力毅 | -20,477 |

## 3. 眼科部\_各月份TW-DRGs 執行狀況

|       | 個案數 | LOS | 醫療費用合.. | DRG支付點.. | 差額      | 申報比值 | CD區佔率  |
|-------|-----|-----|---------|----------|---------|------|--------|
| 11108 | 8   | 1.6 | 408,708 | 384,733  | -23,975 | 0.94 | 50.0%  |
| 11109 | 12  | 1.8 | 547,076 | 504,863  | -42,213 | 0.92 | 58.3%  |
| 11110 | 9   | 1.9 | 311,796 | 294,183  | -17,613 | 0.94 | 77.8%  |
| 11111 | 23  | 1.7 | 751,574 | 728,085  | -23,489 | 0.97 | 72.7%  |
| 11112 | 15  | 1.8 | 464,428 | 497,670  | 33,242  | 1.07 | 40.0%  |
| 11201 | 9   | 1.8 | 437,882 | 520,021  | 82,139  | 1.21 | 100.0% |
| 11202 | 14  | 2.2 | 490,094 | 577,945  | 87,851  | 1.12 | 64.3%  |
| 11203 | 22  | 2.5 | 437,882 | 495,716  | 57,834  | 1.06 | 63.6%  |
| 11204 | 12  | 1.8 | 444,135 | 548,470  | 104,335 | 1.14 | 66.7%  |
| 11205 | 12  | 1.8 | 344,851 | 327,747  | -17,104 | 1.13 | 58.3%  |
| 11206 | 11  | 1.8 | 344,851 | 327,747  | -17,104 | 1.23 | 63.6%  |
| 11207 | 10  | 1.8 | 344,851 | 327,747  | -17,104 | 0.95 | 88.9%  |

Key performance Index of TW-DRGs by month

## 5. 各 TW-DRGs 累計差額

|     | 03901<br>雙側水晶体手術，含液.. | 03902<br>眼異物移除手術，含液.. | 03903<br>單側水晶体手術，含液.. | 03904<br>雙側水晶体手術，不含.. | 03905<br>單側水晶体手術，不含.. | 03906<br>眼異物移除手術，不含.. |
|-----|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| 邱子瑜 |                       | 68,468                |                       |                       | -5,848                |                       |
| 曾漢儀 |                       |                       | 5,012                 | 60,483                | -3,943                | 0                     |
| 李學宇 |                       | 52,529                |                       |                       | 3,069                 |                       |
| 劉沛綱 | -43,611               | 45,735                |                       | 69,201                | -30,449               |                       |
| 林憲忠 |                       |                       | 61,067                |                       | -25,522               |                       |
| 吳弘鈞 |                       | 44,004                |                       |                       | -9,784                |                       |
| 鄭凱駿 |                       |                       |                       | 20,651                | -17,755               | 0                     |
| 許淑娟 |                       |                       |                       |                       | 2,605                 |                       |
| 徐旭亮 |                       |                       |                       | 14,258                | -13,220               |                       |
| 李柏延 |                       |                       |                       |                       | -920                  |                       |
| 賴昱宏 |                       |                       |                       |                       | -5,802                |                       |
| 林佳靜 |                       |                       |                       |                       | -15,611               |                       |
| 賴泓吉 | -32,547               | 0                     |                       | 42,968                | -26,607               |                       |
| 張祐誠 |                       |                       |                       |                       | -18,030               |                       |
| 邱力毅 |                       |                       |                       |                       | -20,477               |                       |
| 總和  | -76,158               | 210,736               | 66,079                | 207,561               | -188,294              | 0                     |

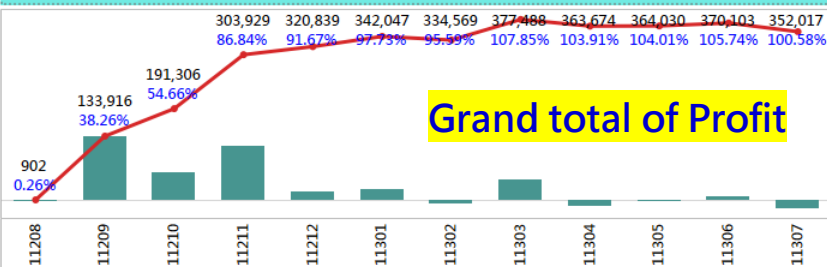
Grand total of Profit by TW-DRGs

# 2024-Ophthalmology TW-DRGs dashboard

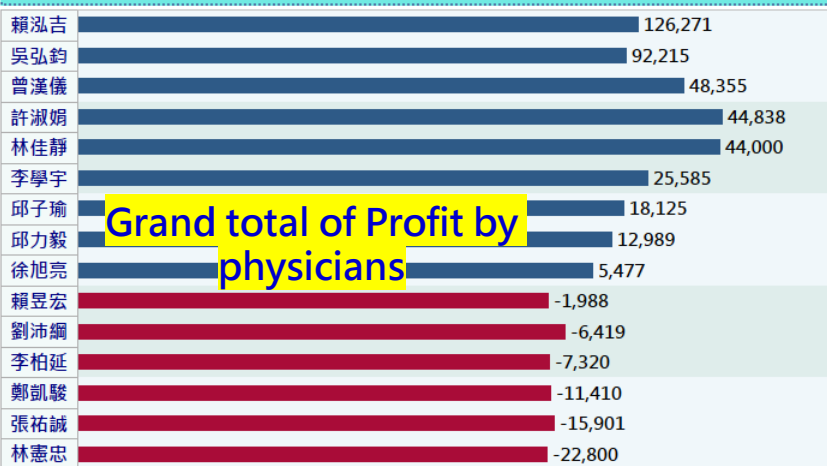
## 1. 全院\_TW-DRGs 各指標執行狀況 (同期比)

| 11.. 112.. | 個案數 | LOS | 醫療費用合計    | DRG支付點數   | 差額      | 申報比值 | CD區個案數 | CD區佔率 |
|------------|-----|-----|-----------|-----------|---------|------|--------|-------|
|            | 130 | 1.8 | 4,644,374 | 4,996,391 | 352,017 | 1.08 | 101    | 80.8% |
|            | 157 | 1.9 | 5,709,299 | 5,929,223 | 219,924 | 1.04 | 102    | 68.0% |

## 2. 眼科部\_TW-DRGs 累計差額 (目標值 : 350,000)



## 4. 各醫師TW-DRGs\_年總計差額



## 3. 眼科部\_各月份TW-DRGs 執行狀況

|       | 個案數 | LOS | 醫療費用合.. | DRG支付點.. | 差額      | 申報比值 | CD區佔率  |
|-------|-----|-----|---------|----------|---------|------|--------|
| 11208 | 13  |     |         |          | 902     | 1.00 | 69.2%  |
| 11209 | 7   |     |         |          | 133,014 | 1.41 | 42.9%  |
| 11210 | 12  |     |         |          | 57,390  | 1.14 | 83.3%  |
| 11211 | 11  |     |         |          | 112,623 | 1.25 | 63.6%  |
| 11212 | 8   | 1.9 | 347,895 | 364,805  | 16,910  | 1.05 | 62.5%  |
| 11301 | 10  | 1.8 | 327,750 | 348,958  | 21,208  | 1.06 | 80.0%  |
| 11302 | 4   | 2.0 | 132,029 | 124,551  | -7,478  | 0.94 | 100.0% |
| 11303 | 14  | 1.7 | 522,089 | 565,008  | 42,919  | 1.08 | 78.6%  |
| 11304 | 18  | 1.8 | 602,724 | 588,910  | -13,814 | 0.98 | 88.9%  |
| 11305 | 10  | 2.1 | 328,117 | 328,473  | 356     | 1.00 | 90.0%  |
| 11306 | 13  | 1.8 | 454,294 | 460,367  | 6,073   | 1.01 | 69.2%  |
| 11307 | 10  | 1.6 | 316,316 | 298,230  | -18,086 | 0.94 | 100.0% |

Key performance Index of TW-DRGs by month

## 5. 各 TW-DRGs 累計差額

|     | 03901<br>雙側水晶体手術，含玻璃體.. | 03902<br>眼異物移除手術，含玻璃體.. | 03903<br>單側水晶体手術，含玻璃體.. | 03904<br>雙側水晶体手術，不含玻璃.. | 03905<br>單側水晶体手術，不含玻璃.. |
|-----|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| 賴泓吉 | 97,167                  |                         |                         | 60,180                  | -31,076                 |
| 吳弘鈞 |                         | 116,939                 | 29,465                  |                         | -54,189                 |
| 曾漢儀 |                         |                         | 16,466                  | 35,506                  | -3,617                  |
| 許淑娟 |                         | 43,960                  |                         |                         | 878                     |
| 林佳靜 |                         | 49,550                  |                         |                         | -5,550                  |
| 李學宇 |                         |                         | 33,343                  |                         | -7,758                  |
| 邱子瑜 |                         |                         |                         | 21,794                  | -3,669                  |
| 邱力毅 |                         |                         |                         | 20,333                  | -7,344                  |
| 徐旭亮 |                         |                         |                         | 15,077                  | -9,600                  |
| 賴昱宏 |                         |                         |                         |                         | -1,988                  |
| 劉沛綱 |                         |                         |                         | 6,521                   | -12,940                 |
| 李柏延 |                         |                         |                         |                         | -7,320                  |
| 鄭凱駿 |                         |                         |                         |                         | -11,410                 |
| 張祐誠 |                         |                         |                         |                         | -15,901                 |
| 林憲忠 |                         |                         |                         |                         | -22,800                 |
| 總和  | 97,167                  | 210,449                 | 79,274                  | 159,411                 | -194,284                |

Grand total of Profit by TW-DRGs

The payment of 03905 Needs to be adjust.



# Results & Conclusion

- A total of 271 patients were included.
- The **total medical expenses has significantly decreased** ( $p < 0.01$ ) and the **profit has increased** ( $p < 0.01$ ).
- The professionalism of physicians and medical practices is difficult to objectively assess.
- Through peer comparison of medical expenses by DV, it can effectively influence physicians' medical decision-making.
- This research is related to the HPH main theme of "**empowering through effective organization of communication and information.**"



# References

- Qin, X., Luo, Y., Tang, N. et al. (2020). Making data visualization more efficient and effective: a survey. *The VLDB Journal* 29, 93–117. <https://doi.org/10.1007/s00778-019-00588-3>.
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## 高雄醫學大學附設中和紀念醫院

Kaohsiung Medical University Hospital, Kaohsiung Medical University  
(Kaohsiung Medical University Chung-Ho Memorial Hospital)

# Thank You!

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