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Improving Medical Care in Low-resourced Areas by using Service Innovationand Digital Health Network with Information Communication Technology-- "The Yunlin Twin-star Acute Care Resource-Sharing Project "

Wan-Ling Liao, RN, MS1; Ming-Tai Cheng, MD, MPH1; Wen-Chul Chiang, MD, PhD1; Peng-Chan Lin2; Matthew Huei-Ming Ma, MD, PhD1.

1 Department of Emergency Medicine, National Taiwan University Hospital Yunlin Branch, Taiwan

2 National Cheng Kung University Hospital Dou-Liou Branch, Taiwan

Introduction

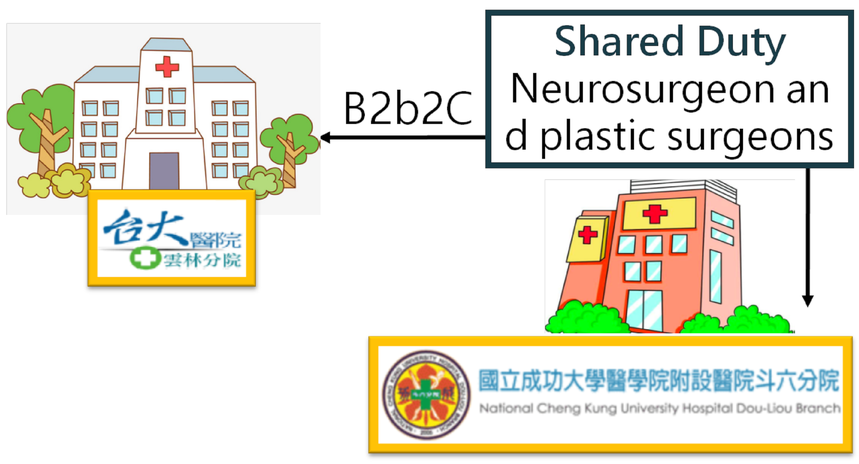
Yunlin County is a one of least developed area in west Taiwan. The medical resources in Yunlin Countyare inadequate and uneven. There are two dominant hospitals, National Taiwan University Hospital Yunlin Branch (NTUH-YLB) and National Cheng Kung University Hospital Douliu Branch (NCKUH-DLB) in east Yunlin. However, many acute trauma patients still needed long-distance transportation outside the county for neurosurgical or plastic surgical care due to these subspecialists' services were not 24/7 in both hospitals in the past. Therefore, we initiated an acute care resources-sharing project, the "Twin-star project", to improve the medical care of acute trauma patients with neurosurgical or plastic surgical needs via information communication technology (ICT) and service innovation.

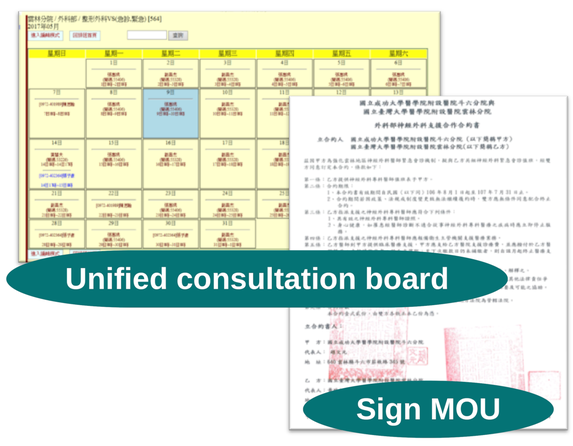
Method

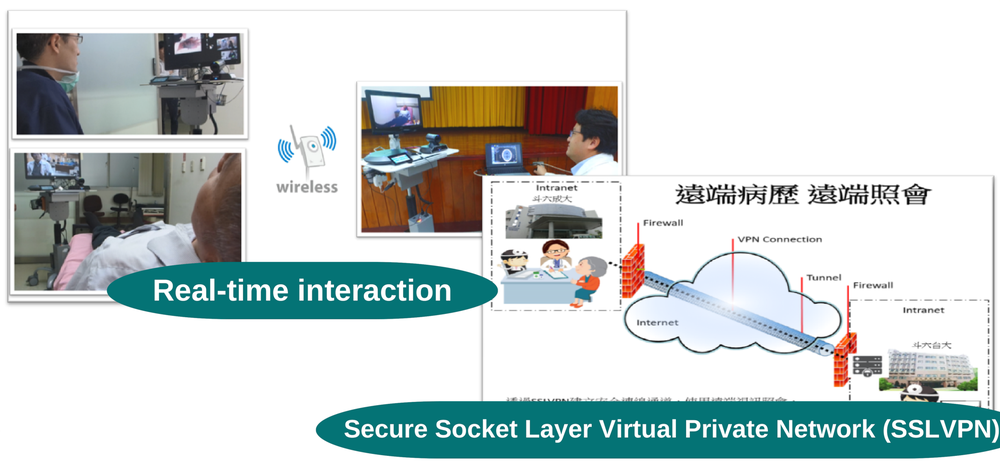
The "Twin-star project"has been initiated since 2017 and implemented since March 2018. There were three main barriers for providing coordinated subspecialists' services, including medical laws/regulations from the government,parochialism/departmental selfishnessin each hospitals/departments and great differences of hospital information system (HIS) in both hospitals. We tried to break these barriers as following ways:

1.Get through obstacles of regulations: We proposed this project as a pilot project to the government and it had been proved in mid-2017.
2.Reachcooperation agreements and sign contracts between NTUH-YLB and NCKUH-DLB. Then we created a shared and coordinated neurosurgical/plastic surgical joint shift schedules/on-call lists for 24/7 services.
3.Establish direct connection between hospitals by ICT: We connected HIS between two hospitals via virtual private network (VPN) and also audio-video linkage.Surgeons in both hospitals can direct access patients' medical records and images comprehensively first. Then, medical inquires will be performed via ICTs.Due to the distance between these two hospitals is less than 3 kilometers, Surgeons could decide an in-person visit by themselves, emergency patient-transfer or consultation via ICT only after initial inquires.
4.We also defined the attribution of medical responsibility for medical staff. In-person visit fee, telemedical consultation fee and other reimbursement from both national health insurance (NHI) and bonus were also clarified before project implemented.

Weproposed the Twin-star project as a win-win situation to all stakeholders-patients, doctors, hospitals, and thegovernment.







Result

From March 1st, 2018 to December 31st, 2020, there were 265 patients participated the Twin-star project and 245 patients received hospital transferal. Number of patients transferred time to definite care and the cost of patient transfer before and after the Twin-star project implementation are shown on table 1. Comparing to the data before Twinstar project, number of patients transferred due to neurosurgical or plastic surgical conditions decreased from 9.7 per months to 7.9 per months. There was 48.3% decreased in the group of patients transferred outside to other counties owing to this project. The average time to definite care for acute trauma patients was only few minutes decreased even ICT use before patient transfer and transferred outside to other counties time increased from 149 minutes to 223 minutes in average. The average cost of transferred patients weighted by the patient number in both groups decreased from NTD 4,597 to NTD 3,831 but the cost of transferred outside to other counties increased to NTD 8,005 in average due to more time and distance for transportation. Satisfaction surveys showed satisfaction rate over 80% in 7 doctors, 20 nurses and 65 patients (83.4%, 95% and 90.4%).

	Before the Twin-star Project (2017/03-2018/02; 12 months)		After the Twin-star Project (2018/03-2020/12; 34 months)	
1. Number of patients transferred	Number of patient transferred: 116 (9.7/month)		Number of patient transferred: 245 (7.2/months)	
	transfer between NTUH-YLB and NCKUH-DLB	52 (44.8%)	Transfer between NTUH-YLB and NCKUH-DLB	228 (93.1%)
	transferred outside to other counties	64 (55.2%)	transferred outside to other counties	17 (6.9%)
2. Time to definite care for acute trauma patients	an average of 141 minutes per patient (calculation weighted by the patient number in both groups)		an average of 139 minutes per patient (calculation weighted by the patient number in both groups)	
	transferred between NTUH-YLB and NCKUH-DLB (n=52)	140 min	transferred between NTUH-YLB and NCKUH-DLB (n=228)	133 min
	transferredoutside to other counties (n=64)	149 min	transferredoutside to other counties (n=17)	223 min
3. The cost of patient transfer (paid by patients)	an average of cost 4,597 NTD per patient (calculation weighted by the patient number in both groups)		an average of cost 3,831 NTD per patient (calculation weighted by the patient number in both groups)	
	transferred between NTUH-YLB and NCKUH-DLB (n=52)	3,520 NTD	transferred between NTUH-YLB and NCKUH-DLB (n=228)	3,520 NTD
	transferredoutside to other counties (n=64)	5,472 NTD	transferredoutside to other counties (n=17)	8,005 NTD

Table 1. Number of patients transferred, time to definite care for acute trauma patient and the cost if patient transfer before and after the Twin-star project implementation

Conclusion

The Twin-star project achieved the goal of 'patient-centered care' by decreasing outside-counties' patient transfer and saving money for acute trauma patients who need neurosurgical or plastic surgical care. Therefore, it is a possible way to break the barriers of hospital cooperation to create truly patient-centered care, especially in lowresourced area. However, it did not demonstrated advantages oftimesavingfor patients who needed to transfer to another hospital even ICT assisted in advance.