Impact of TheraNow Telehealth Physical Therapy program on hospital readmission rate post major joint replacement surgery

Abstract:

Background:
Hip and knee replacement are two of the most commonly performed major joint replacement surgeries in orthopedic surgery. Both procedures successfully eliminate pain, correct the deformity, and improve patient mobility to regain quality of life and perform daily life activities. Rehabilitation and recovery are crucial during the 12 weeks following any major joint replacement surgery. Most people are discharged from the hospital 2–3 days after surgery to continue rehabilitation. Specific exercises aim to improve the joint's mobility, improve strength and restore patient function.

The primary cause of hospital readmissions after major joint replacement is infection and can hinder the patient's functional recovery. Therefore, a comprehensive program is essential to reduce infections and promote recovery. The virtual rehabilitation program is an evolving approach to optimize care and compliance. One such program is the TheraNow telehealth physical therapy program. TheraNow integrates artificial intelligence-powered tools and highly trained physical therapists in a care-navigation platform specially designed for rehabilitation after major joint replacement surgery. The objective of this study was to evaluate the impact of the TheraNow Telehealth Physical Therapy program on patient rehabilitation and hospital readmission rate following major joint replacement surgery.

Materials and methods:
Forty patients participated in this particular post-joint replacement virtual rehabilitation program on TheraNow application for an online and in-home physical therapy program. The program incorporated three phases of rehabilitation: pre-rehabilitation, post-surgical rehabilitation, and functional rehabilitation. A licensed physical therapist evaluated the patient via a synchronous video conferencing visit, at which time the Physical Therapist developed a customized program for each patient. Every patient booked appointment according to their own choices of time slots, and the same licensed physical therapists administered the entire program from start to finish for each patient. Physical Therapists provided customized therapy to every patient with a duration of 45-60 minutes of the personalized session. In addition, this study tracked and identified all hospital readmissions within 30 days of discharge from the patients' medical records.

Results:
The overall mean age of the study population was 65.20±8.41. Out of the 40 enrolled patients, 3 (7.50%) are 41-50 years old, while the majority (42.5%) belonged to 61-70 years of age followed by 71-80 years (27.5%) and 51-60 years (22.5%). 23 (57.5%) were female, while 17 (42.5%) were males. Only one re-admission happened due to surgical site infection in the first 30 days after the surgery under the program brought the readmission rate to 2.5%.

Conclusion:
The study reported lower hospital readmission rate after major joint replacement surgeries. The TheraNow Telehealth Physical Therapy program reported a 2.5% readmission rate in the first 30 days of the physical therapy program for major joint replacement surgeries as

compared to the previous literature where they have reported hospital readmission rate of 3.3%- 5.6% in 30 days post-surgical follow-up.

Introduction:

A joint is a place in the body where two or more bones meet to move. A typical smooth gliding joint is formed by cartilage covering the bone surfaces. Osteoarthritis and rheumatoid arthritis are the most prevalent causes of joint replacement. However, inherited illnesses, developmental issues, and trauma may also cause joint discomfort that requires replacement. Conservative therapies including medicines, physical therapy, and injections have failed before joint replacement. Total joint replacement involves removing damaged or arthritic joint pieces and replacing them with a metal, plastic, or ceramic prosthesis or implant.

Total joint replacement or arthroplasty is a surgical procedure where metal, plastic, or ceramic prosthesis or implants replace parts of an arthritic or damaged joint. The prosthesis reproduces the shape and motion of the typical joint through its design. Joint replacement surgery is cost-effective and clinically relevant in appropriately selected patients. As per a recent report, total joint replacement use will increase by 71% from 2018 to 2030 [1]. Preoperative health status (e.g., greater muscle strength and capacity to complete activities of daily living) directly correlate with perioperative outcomes after total joint replacements [2]. Preoperative and postoperative care for patients with total joint replacement is generally adequate for reducing pain intensity and readmission rate [3].

Successful rehabilitation improves pain control, gait, balance, and strength, and reduces the recovery time [4, 5]. Though less commonly used, pre-habilitation (before surgery) has also been recommended [6]. In addition, preoperative health status is a strong predictor of favorable postoperative outcomes [7]. Thus, recovery and rehabilitation are crucial stages after knee and joint replacement surgeries.

Physical therapy (PT) after surgery is one of the essential modalities that hasten recovery. The traditional method for physical therapy is either outpatient clinic PT or home health PT. However, the current evolving technology has led to various digital solutions. One such program is the TheraNow telehealth physical therapy program which offers care on a specialized virtual rehabilitation platform with licensed and trained virtual care physical therapists.

Aim:
The objective of this study was to evaluate the impact of the TheraNow online physical therapy program on hospital readmission rate post major joint replacement surgery.

Methodology:
Forty patients participated in this particular post-joint replacement virtual rehabilitation program on TheraNow application for an online and in-home physical therapy program. The 120-day program started with pre-rehabilitation (30 days pre-operatively), surgery, and then postoperative rehabilitation and functional rehabilitation (90 days post-operatively). Patients, Physicians, and the telehealth therapist agreed when the program met therapy goals for discharge from virtual PT. The therapist carefully monitored patient's response and progression after each therapy session.
To make it more adherent for every patient, patients booked appointments according to their own choices of time slots and the same licensed physical therapists administered the entire program from start to finish for each patient. Physical Therapists provided customized therapy to every patient with duration of 45-60 minutes of the personalized session. In addition, the Physical Therapist received in-depth knowledge of every patient's condition before 1-1 online physical therapy sessions via video consultations for custom and effective care programs. Program administrators evaluated all hospital readmissions within 30 days of discharge, identified from the administrative records by reviewing patients' medical records.

Inclusion criteria:
● Patients with pre-diagnosis of DRG 470 (Major joint replacement or reattachment of lower extremity without major complication or comorbidity) procedure in the next 90 days were included in the study.
● Participants included males and females of age 40 or above in this study.

Exclusion criteria :
● Patients with pre-diagnosis of DRG 469 (Major joint replacement or reattachment of the lower extremity with major complication or comorbidity) procedure in next 90 days.
● Patients who were unable or unwilling to provide informed consent were excluded from the study.
● Patients of age < 40 years of age were excluded from the study.

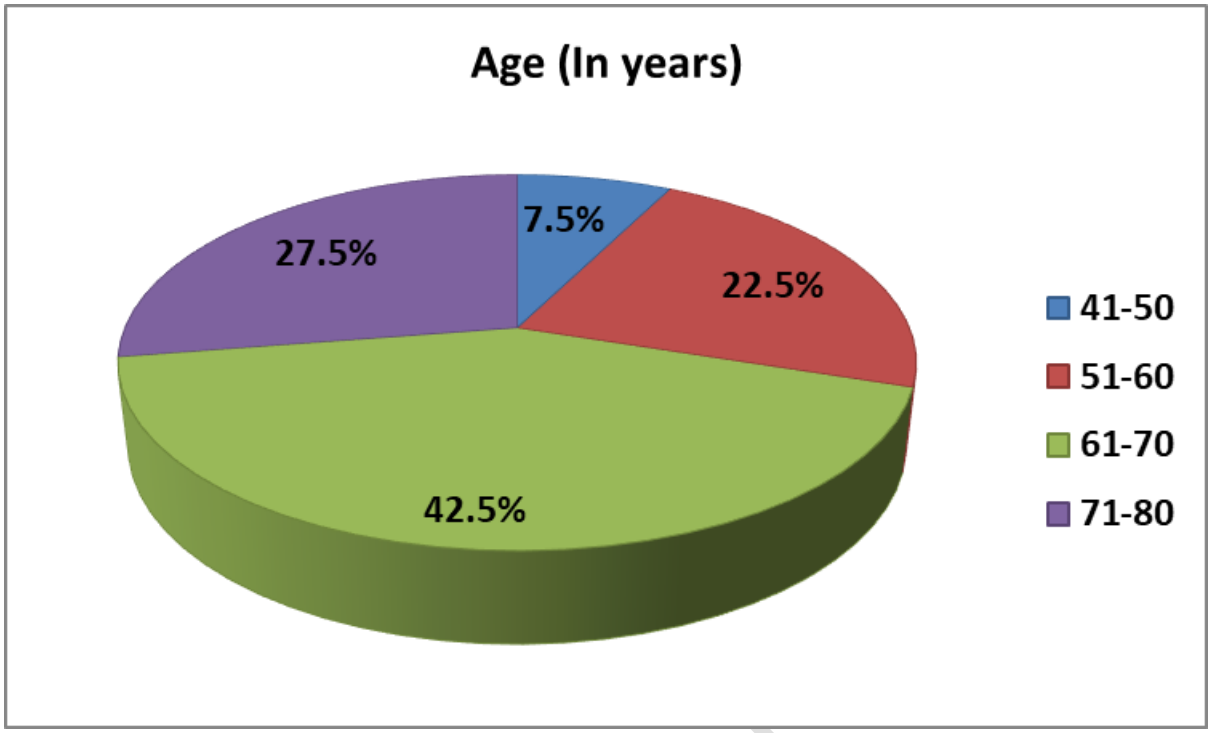
Before surgery, patients virtually met with their TheraNow physical therapist, demonstrated the ability to use the application system, and received recommended exercises to begin after returning home following surgery. Program administrators also offered home visits to patients in need. The postoperative rehabilitation phase started within 48 hours of hospital discharge with a virtual Physical Therapy evaluation and 2-3 follow-up visits per week for 12 weeks. The physical therapist reviewed progress every week and revised the therapy regimen accordingly. Patients could use the system immediately after hospital discharge to view their progress. The frequency and duration of use were unrestricted. The TheraNow system tracked activity, performance, and exercise quality; the telehealth therapist monitored the patient's progress synchronously and asynchronously. In addition, all patients who were randomized to virtual PT could receive in-person PT as clinically deemed necessary. In the initial 30 days after surgery, program administrators analyzed re-admission rates by collecting data by reviewing patients' medical records.

Results:
Out of 40 enrolled patients, the overall mean age of the study population was 65.20±8.41; 23 (57.5%) are female, and 17 (42.5%) are males. Out of all the 40 patients, only one patient was readmitted to the hospital within the first 30 days after the surgery under the program bringing the readmission rate to 2.5 %.

Table 1: Demographic details of the patients

Variables		Number	%
Age	Mean±SD	65.20±8.41	
	41-50	3	7.5
	51-60	9	22.5
	61-70	17	42.5
	71-80	11	27.5
Gender	Female	23	57.5
	Male	17	42.5
Total		40	100.0

Fig 1: Age (in Years)



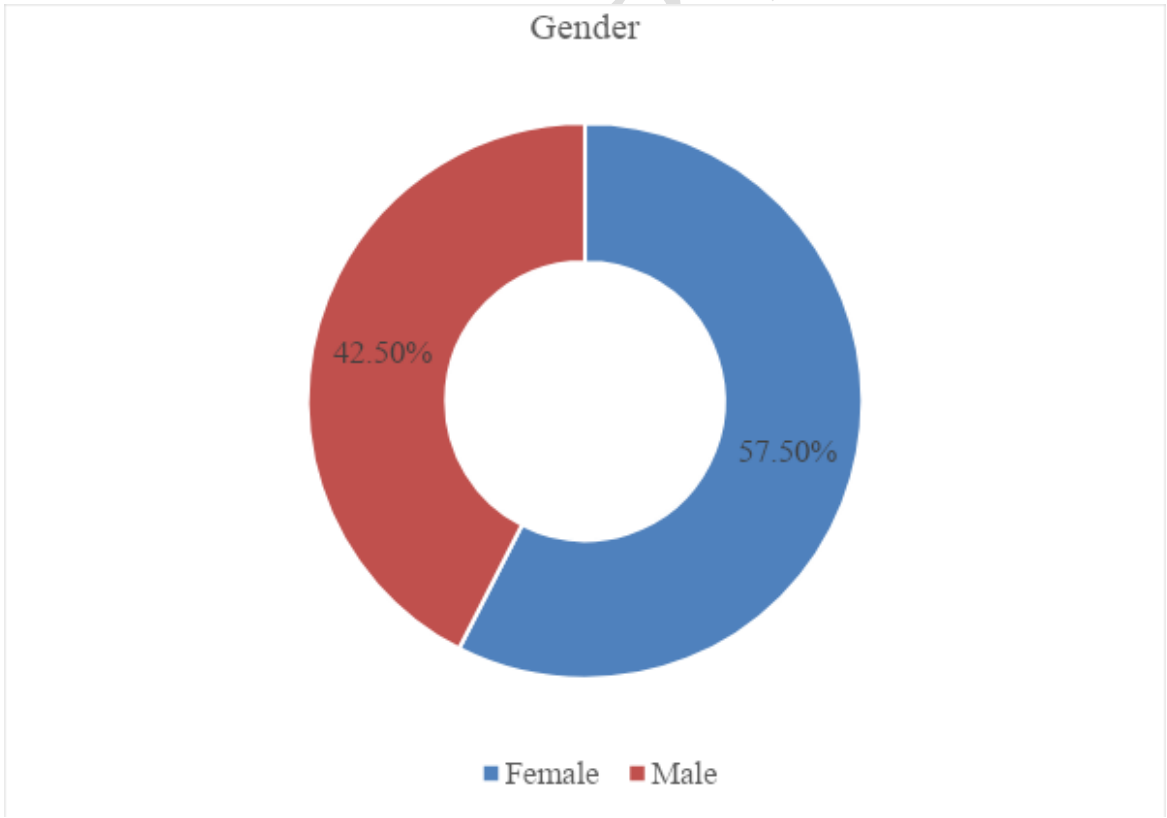


Fig 2: Gender

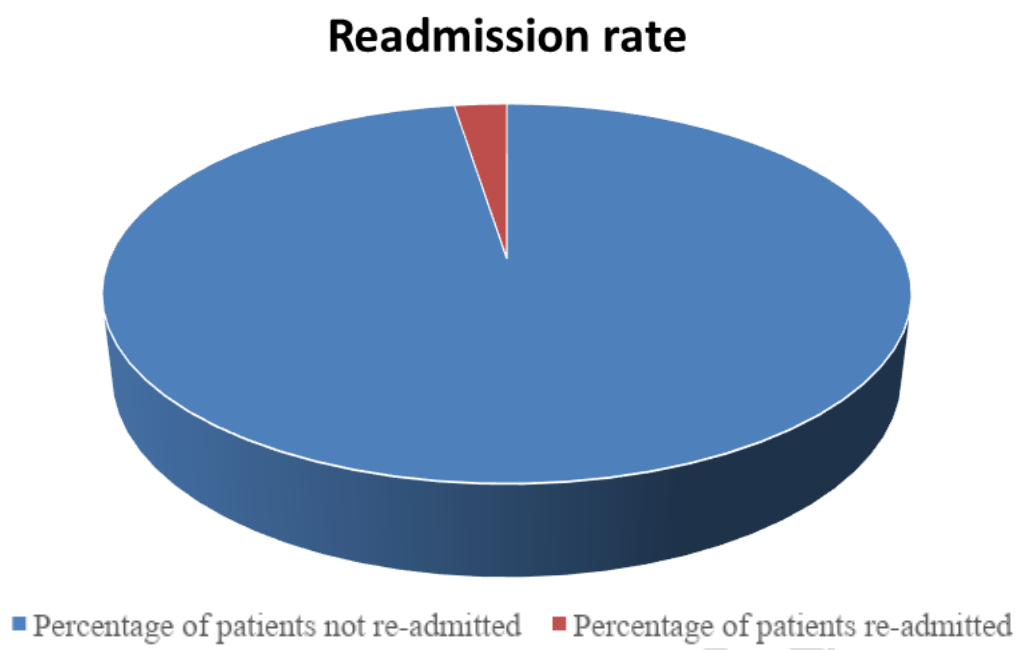


Fig 3: Readmission Rate

Discussion:
Tele-rehabilitation refers to rehabilitation care delivery via information and communication technology (ICT). Clinically, telerehabilitation includes a range of rehabilitation services like assessment, monitoring, prevention, intervention, supervision, education, consultation, and counseling delivered to adults and children by a team of physical and occupational therapists, speech-language pathologists, audiologists, rehabilitation physicians and nurses, rehabilitation engineers, assistive technologists, teachers, psychologists, and dieticians based on client's needs. TheraNow is a telerehabilitation program, a next-generation digital, physical therapy, and care application powered by human touch and artificial intelligence.

The World Health Organization defines rehabilitation as "a progressive, dynamic, goal-oriented and often time-limited process, which enables an individual with impairment to identify and reach his/her optimal mental, physical, cognitive and/or social functional level." [8] After total hip or knee replacement, physical therapy is a standard and essential treatment. It aims to maximize functionality and independence and minimize complications such as wound infection, deep vein thrombosis, pulmonary embolism, and hip dislocation (for hip replacements). The physical therapy routine has 4 components: therapeutic exercise, transfer training, gait training, and instruction in activities of daily living (ADL) [9]. Ouellet and Moffet [10] report that large locomotor deficits exist 2 months after joint replacement surgery, which partially supports the rationale for physical therapy after total joint replacement. However, physiotherapy rehabilitation for total joint replacement patients varies in where, when, and how it is delivered [11, 12].

After discharge from the hospitals, patients who have had primary total knee or hip replacement surgery may receive physical therapy as an in-patient or outpatient service. In-patient services are the physical therapy services rendered at a rehabilitation hospital or specialized hospital unit. Outpatient physical therapy is done either at an outpatient rehabilitation clinic (clinic-based) or in the patient's home (home-based). The traditional method for physical therapy is either outpatient clinic PT or in-home physical therapy. An

online physical therapy program is the current advancement in this field. “Relative to conventional home or clinic physical therapy, telerehabilitation for skilled clinical oversight and delivery of care significantly lowered three-month health-care costs after joint replacements while providing similar effectiveness,” according to the clinical trial report by Janet Prvu Bettger, ScD, of Duke University, Durham, N.C.

Using a randomised control study design, Gilbey et al. [13] investigated the benefits of a personalised preoperative and postoperative exercise programme on functional recovery and muscle strength after main hip replacement surgery. A preoperative exercise programme commencing 8 weeks before hip replacement surgery increases levels of pain, stiffness, physical function, hip flexion range of motion, and muscular strength in patients with end-stage hip illness, according to the findings of Gilbey et al. The Royal Dutch Society for Physical Therapy (KNGF) [14] and the National Institute for Health and Clinical Excellence (NICE) [15] recommendations do not generally prescribe preoperative rehabilitation. Preoperative rehabilitation is recommended by the American Academy of Orthopaedic Surgeons (AAOS) guideline [16], despite the fact that the evidence for this practise is weak generally.
This study focuses on 30-day readmission which is 2.5%. According to the previous literature, there has been reported hospital readmission rate of 3.3%- 5.6% in 30 days post-surgical follow-up.[17]

Tele-rehabilitation clinical trials for patients undergoing total joint replacement have demonstrated better clinical outcomes, costs, and patient satisfaction than traditional physical therapy, without additional patient risks [18-20]. Audio-video conferencing between trained therapists and patients removes geographic and transportation barriers but does not address the limited number of therapists available to manage the number of patients in need of care. It is unclear if the findings for this virtual rehabilitation platform generalize to other virtual physical therapy programs; however, the present study demonstrates opportunities to innovate to make physical therapy accessible and integrated into the episode of care. Meeting the demands of PT is challenging. A nationwide shortage of therapists is projected [21]. Few therapists are available in traditionally underserved areas. Health insurance, including Medicare, limits the number of physical therapy visits. Paying for physical therapy out of pocket is expensive. Digital health technology for PT could be an effective, low-cost as it reduces planned therapy visits travel cost, and accessible option to help patients regain physical function after joint replacement surgeries.

Conclusion

The present study concluded that TheraNow Telehealth Physical Therapy program reported a 2.5% readmission rate in the first 30 days of the physical therapy program for major joint replacement surgeries as compared to the previous literature where they have reported hospital readmission rate of 3.3%- 5.6% in 30 days post-surgical follow-up.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because

we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

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