

Outcomes of multidisciplinary team interventions in the management of sickle cell disease patients with opioid use disorders

A retrospective cohort study

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ABSTRACT

الأهداف: تهدف هذه الدراسة إلى تحديد حجم وجود اضطراب استخدام الأفيونات في المرضى المصابين بفقر الدم المنجلي، وكذلك التأكيد على دور الفريق المتعدد التخصصات، وتقدير فعالية التكلفة وفعالية الاستخدام السليم للأدوية المخدرة. بالإضافة إلى المساعدة في تقليل زيارات الطوارئ ومدة الإقامة بالمستشفى.

المنهجية: دراسة جماعية بأثر رجعي لمرضى الأنيميا المنجلية للذين تزيد أعمارهم عن 14 سنة ويعانون من اضطراب استخدام الأدوية الأفيونية. تم جمع البيانات في الفترة من يناير 2016م إلى ديسمبر 2018م. تشمل هذه البيانات عدد الزيارات لقسم الطوارئ، مدة الإقامة بالمستشفى، استهلاك الأدوية المخدرة وتبع وصف الأدوية المخدرة. تم متابعة المجموعة المستهدفة بمجموعة من التداخلات لمعالجة الألم واستخدام موارد الرعاية الصحية.

النتائج: تم تحديد 21 مريضاً يعانون من اضطراب استخدام الأفيونات، و بعد الإجراءات التداخلية كان هناك انخفاض كبير في عدد زيارات غرفة الطوارئ (8709 زيارة في عام 2016م إلى 94 زيارة في عام 2018م). انخفض استهلاك المورفين والمبيبريدين بمقدار 82% و60% على مدى ثلاث سنوات على التوالي، علاوة على ذلك كان هناك انخفاض كبير في تكلفة زيارات غرفة الطوارئ ومدة الإقامة بالمستشفى.

الخلاصة: إنشاء فريق متعدد التخصصات بالإضافة إلى مجموعة من التداخلات لمرضى الأنيميا المنجلية المصابون باضطراب استخدام الأفيونات والتي تشمل الأنشطة التثقيفية لكل من الممارسين الصحيين والمرضى ومقدمي الرعاية وإنشاء عيادة خاصة لعلاج الأم الأنيميا المنجلية وعبادة رعاية مرضى الأنيميا المنجلية (عبادة الإدمان) وتنفيذ نظام تتبع الوصفة الطبية للأدوية المخدرة أدى إلى انخفاض كبير في التكلفة وفي عدد زيارات غرفة الطوارئ وكذلك مدة الإقامة بالمستشفى وانخفاض استهلاك الأدوية الأفيونية (المخدرة) بشكل كبير.

الكلمات الرئيسية: اضطراب استخدام الأفيونات، الفعالية من حيث التكلفة، مدة الإقامة في المستشفى، استهلاك المواد الأفيونية، التحكم في الألم.

Objectives: To identify the magnitude of opioid use disorder (OUD) among sickle cell disease (SCD) patients; emphasize on multidisciplinary team (MDT) role; estimate cost-effectiveness following the proper use of therapeutic guidelines; and facilitate the reduction of emergency room (ER) visits and the length of stay (LOS).

Methods: This retrospective cohort study included SCD patients aged 14 years and above, who

have OUD. Data was collected between January 2016 and December 2018. Data included ER visits, hospital LOS, opioid consumption, and narcotic prescription tracking. The target group was followed with a set of interventions for pain management and healthcare resource utilization.

Results: Twenty one SCD patients were identified with OUD. Following the interventions, there was a statistically significant decrease in ER visits of these OUD patients (from 8709 visits in 2016 to only 94 in 2018). Morphine consumption decreased by 82% and meperidine by 60%, over the 3-year period. Moreover, there was a huge reduction in both ER and LOS costs for this cohort of patients.

Conclusion: Establishing an MDT and a series of interventions for SCD patients with OUD, including educational activities for caregivers and patients; establishing a palliative/pain clinic and a SCD addiction clinic; and implementing an adequate opioid prescription tracking system resulted in a significant reduction in both the cost and number of ER visits and hospital LOS and dramatically decreased opioid consumption.

Keywords: opioid use disorder, cost-effectiveness, length of stay, opioid consumption, pain management

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Sickle cell disease (SCD) is a common autosomal recessive hematologic disorder in the Kingdom of Saudi Arabia. Prevalence of sickle cell trait ranges from 2-27%. The disease is characterized by the production of abnormal readily polymerized hemoglobin S that is responsible for the characteristic disease complications.¹ Vaso-occlusive crisis (VOC) is the most common among SCD complication and is responsible for most emergency room (ER) visits and hospital admissions.² Analgesics are the cornerstone for VOC treatment with varying doses and types according to the severity of pain. Han et al,³ reported that opioid medications were used by 39.9% of patients, and that only 31.8% of patients took immediate-release and 0.4% of patients took extended-release opioids, while 7.8% have used both forms. Patients with avascular necrosis were found to use higher doses. The rate of opioid use increases dramatically with age peaking at 58.3% in patients between 20-29 years of age.³ Numerical pain scores are extensively used in pain assessment for SCD patients; however, it can be misleading, especially in a group of patients with a high risk of developing opioid use disorder (OUD).⁴ Therefore, a more objective method of pain assessment and re-assessment is essential for proper management and avoiding unnecessary interventions. There is a limited number of studies that describe OUD in patients with SCD. In this study, we identified a group of SCD patients with OUD who showed a significant decrease in dependence on hospital resources (including medication, hospital stays, and ER visits) after successful interventions adopted by the King Salman North West Armed Forces Hospital (KSAFH), Tabuk, Saudi Arabia.

Methods. This retrospective cohort study of SCD patients with OUD was carried out in KSAFH, Tabuk, Saudi Arabia which serves as a tertiary care hospital and referral center for the northwestern region of the country. An ethical approval for the study was obtained from the Ethical and Research Committee of the hospital.

The inclusion criteria were as follows: SCD patients, aged >14 years and who have confirmed diagnosis of OUD were included in this study. The exclusion criteria were as follows: SCD patients aged 14 years or less; SCD patients (>14 years) without OUD.

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In the view of the problems like frequent ER visits, increased length of stay, reiterated aggression incidences by a group of SCD patients, a multidisciplinary team (MDT) was formed and have set some investigations to establish the diagnosis of patients with SCD who have OUD. These included the justification for ER visits and long hospital stays with the use of detailed medical reports and review of medical files. Moreover, to confirm the diagnosis of OUD, the assessment by a psychiatrist with addiction specialty is mandatory.

After defining the magnitude of the problem, the targeted group was subsequently followed with a set of interventions for optimum pain management and health care resource utilization. The following pathway elaborates set of interventions and working mechanism of the MDT (**Figure 1**).

The data regarding number of ER visits, hospital length of stay (LOS), amount of opioid consumption in

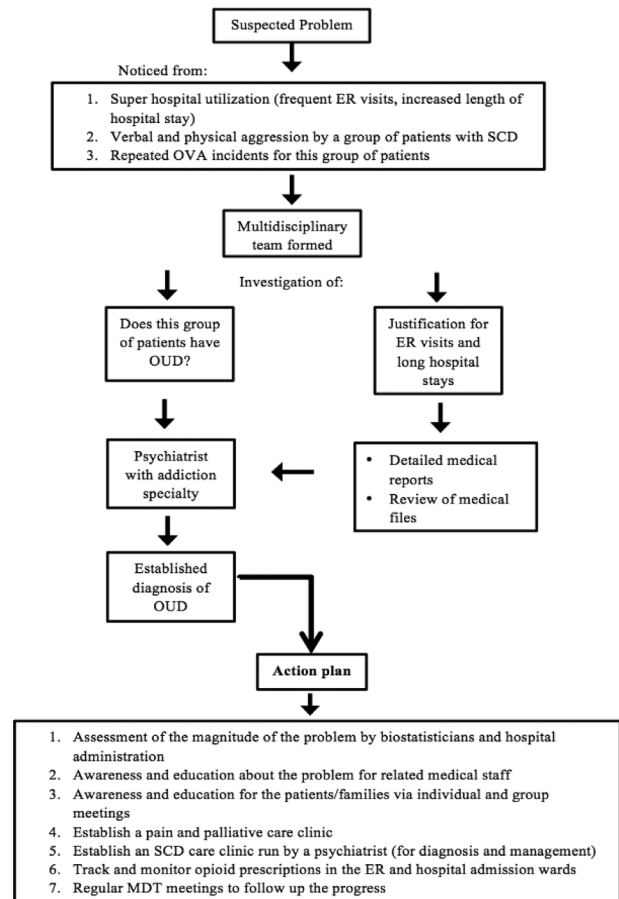


Figure 1 - The set of interventions and working mechanism of the multidisciplinary team (MDT). ER: emergency room, SCD: sickle cell disease, OUD: opioid use disorder, OVA: occurrence, variance, and accident

the ER and in-patient wards, and narcotic prescription tracking were collected for SCD patients who have OUD under regular follow up for a 3-year period between January 2016 and December 2018.

Statistical analysis. All demographic and clinical data were collected and analyzed using the Statistical Package for Social Sciences, version 20 (IBM Corp, Armonk, NY, USA). Frequencies and percentages of the descriptive analysis of the data were presented in tabulated and graphical form. Paired sample t-test was used to compare the ER visits of this cohort of patients during the different years of the study period (2016 to 2018). A *p*-value <0.05 was considered significant.

Results. After a thorough investigation, 21 SCD patients were reported as diagnosed with OUD. Eighteen (67%) of these were male and majority (14, 67%) were aged 26 to 35 years. The frequency of the ER visits was gradually decreased during the successive months of the study period (Figure 2). Paired sample t-test was used to compare the number of ER visits of this cohort of OUD patients for 3 consecutive years (2016 to 2018) and there was a statistically significant decrease in number of ER visits from 8709 in 2016, to 799 in 2017, to 94 in 2018 (*p*=0.00) (Tables 1 & 2). In addition, there was a dramatic reduction in the cumulative hospital LOS of these SCD patients with OUD from 2051 days in 2016 to 80 days in 2018

(Table 2).

Tracking and monitoring of the opioid prescriptions in the emergency department and hospital admission wards was one of the most important task in the action plans of the MDT. As a results of the interventions, there was a significant reduction in the hospital use of parenteral morphine (10 mg/ml) in both ER visits (11940 ampules in 2016 vs. 2088 ampules in 2018) and in-patient (29149 ampules in 2016 vs. 11412 ampules in 2018) admissions (Table 3). There was also a significant reduction in the hospital consumption of parenteral meperidine over the study period.

Table 1 - Statistical analysis between emergency room visits in 2016 to 2018 for SCD patients (cohort of 21 patients) with OUD.

Comparison	Mean±SD	T-statistics	P-value	Result
ER visits in 2016	414.7±227.8			Average ER visits in 2017 are significantly lower than in 2016
ER visits in 2017	38.05±49.1	8.24	0.00	
ER visits in 2017	38.05±49.1			Average ER visits in 2018 are significantly lower than in 2017
ER visits in 2018	4.48±5.9	3.21	0.00	
ER visits in 2016	414.7±227.8			Average ER visits in 2018 are significantly lower than in 2016
ER visits in 2018	4.48±5.9	8.29	0.00	

ER: emergency room, SCD: sickle cell disease, OUD: opioid use disorder

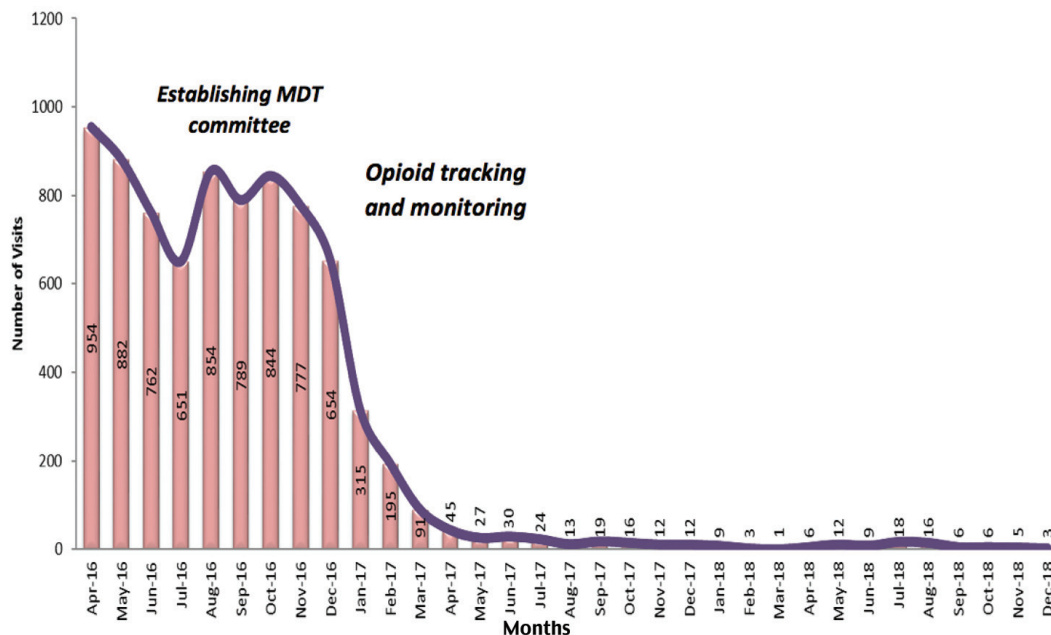


Figure 2 - Cumulative number of emergency room visits for patients with sickle cell disease comorbid with opioid use disorder (Cohort of 21 Patients) from April 2016 to December 2018. MDT: multidisciplinary team

Table 2 - Comparison of accumulated ER and admissions costs endured by the hospital in 2016 to 2018 for SCD patients (cohort of 21 patients) with OUD.

Year	Number of ER visits	ER visits		Admissions	
		Cost endured by the hospital (USD)	LOS	Cost endured by the hospital (USD)	
2016	8709	7141380	2051	6173510	
2017	799	655180	256	770560	
2018	94	77080	80	240800	

ER: emergency room, SCD: sickle cell disease, OUD: opioid use disorder, USD: American dollars, LOS: length of stay

Table 3 - Consumption rate of parenteral morphine (10 mg/ml) and meperidine (2016 to 2018).

Year	Morphine		Meperidine	
	ER	In-patient	ER	In-patient
2016	11940	29149	9194	27439
2017	3159	10848	3336	10801
2018	2088	11412	334	8665

ER: emergency room

Consequently, at the end of all these implementations furnished by MDT for 3 consecutive years, we were in a position to compare the cost endured by the hospital in the services for this cohort of OUD patients. The cost borne by the hospital for ER visits by this cohort of patients decreased by 99% (Table 2). The total cost of admissions decreased by 96% (Table 3). The cost of services was calculated according to a study in 2009 by Ballas⁵ and according to hospital costs estimated by the World Health Organization (WHO) in KSA.⁶

Discussion. Pain is a hallmark comorbid symptom of SCD and accounts for the majority of pediatric and adult admissions and ER visits. The pain characteristics are unique, as the pain is unpredictable and occurs frequently due to repeated vaso-occlusive and painful crises. In addition, chronic pain, which manifests more in adults, can lead to poor quality of life.⁷

Pain can be a significant feature of SCD for patients who lack effective treatment, particularly disease-modifying agents such as hydroxyurea, and who inappropriately use analgesics. A proportion of SCD patients known as super hospital utilizers are responsible for a disproportionate number of ER visits and hospital admissions, defined as ≥12 admissions per year.⁸

A retrospective cohort study was carried out to identifying a group of super utilizer SCD patients diagnosed with OUD. We compared the rate of hospital utilization, opioid consumption, ER visits, and hospital

admissions in addition to cost-effectiveness before and after implementing an intensive interventional strategy to solve this problem.

Twenty-one patients (mostly male) representing 9% of adult patients with SCD were diagnosed with OUD. Some evidence suggests that the prevalence of OUD among SCD patients is similar to general United States (US) population.⁹ Martin et al¹⁰ reported an incidence of OUD ranging from 0.2% to 2% in SCD patients in the US. Higher incidences were reported in different parts of Nigeria (17.8% in the northeast and 10% in the southeast) with a higher proportion of males.^{11,12} These values confirm the incidence variation according to geographical location; however, the higher incidence in our study can be attributed mainly to the clear deviation from the clinical practice guidelines.

Opioid use disorder at our hospital was noticed as a result of super hospital utilization in the form of frequent ER visits, increased LOS, aggressive behavior on the part of patients with SCD, and an increased number of incidents involving this cohort of patients, as detected by the occurrence, variance, and accident (OVA) incident reporting system. After interviewing these patients, it was found that several factors contributed to the incidents, including chronic pain syndrome and psychosocial issues, such as financial problems and depression. Interestingly, Jonassaint et al¹³ found a significant overlap between depression and chronic pain in patients with SCD, where patients with depression had almost 3 times greater relative risk of being high health care utilizers and 50% higher rate of hospitalization (2.9 vs. 1.8 hospitalizations per year).

As an initial step, an MDT was formed (Table 4) to determine whether these patients have OUD or not and to examine whether the frequent ER visits and LOS were justifiable. Subsequently, a consultant psychiatrist and addiction specialist succeeded in proving the diagnosis of these patients using the DSM-5 diagnostic criteria.¹⁴ A thorough investigation of patients' medical records and a review of complete medical reports obtained from the responsible physicians confirmed a clear diagnosis

Table 4 - List of multidisciplinary team members.

Main MDT members	Supporting team
Consultant hematologist	Health educator
Internal medicine representative	Social worker
Pain and palliative care service consultant	Religious affairs representative
Consultant psychiatrist	Quality representative
Pharmacist	Biostatistician
Nursing staff representative	Secretary
Emergency department supervisor	

MDT - multidisciplinary team.

of OUD for this cohort of patients. At this point, an intensive interventional strategy was initiated.

A limited number of studies in the literature have highlighted OUD in patients with SCD, and some authors have clarified the effectiveness of implementing different types of interventions to reduce the rate of ER visits and hospital stays. In their retrospective cohort study, Koch et al,¹⁵ compared the rate of admission before and after the opening of a clinic for adults with SCD. They found that a management strategy at the clinic focusing on super-utilizing adults with SCD lowered the admission rate.

Other previous study has focused on the hospital days for patients with uncomplicated painful crises and on a comprehensive model of care and its impact on morbidity and mortality. However, none have been concerned with SCD patients with a diagnosis of OUD.¹⁶⁻¹⁸

This study is focus on OUD in patients with SCD and to emphasize the need to establish an intensive interventional strategy to improve this problem. This strategy (action plan) includes 7 main points. The first step is to improve the awareness and education of medical staff. Patients with SCD and VOC can be either undertreated or overtreated. Physicians and nurses have been known to have negative attitudes on pain management for patients with SCD. In a survey by Shapiro et al,¹⁹ stated that 53% of ER physicians and 23% of hematologists think that more than 20% of adult patients with SCD have OUD. Another study showed that 63% of nurses believed that OUD is common among adult SCD patients, and 30% are reluctant to give the recommended dose of opioids upon evaluation.²⁰ The consequence of this systematic bias is the undertreatment of pain for many adults with SCD.

Following guidelines and sticking to policies are mandatory to treat patients in an evidence-based approach. We achieved awareness and education for the staff through rounds, regular meetings with medical staff, workshops, and presentations. Furthermore, updated guidelines were distributed in different hospital departments to improve physicians' knowledge regarding the standard of care for patients with SCD, particularly those experiencing a painful crisis. The importance of awareness of SCD has been addressed in many studies. For instance, one study suggests that the attitude of clinicians toward SCD patients may be improved through a short and relatively easy to implement intervention. That study used an 8-minute video as an educational resource for health care providers addressing the challenges of pain management and the

patient perspective in managing acute painful crises.²¹

Similarly, there has been much attention focused on awareness and education for patients and their caregivers. For example, individualized and group meetings have been very successful in identifying different factors that contribute to high hospital utilization. Addressing these factors (namely, social issues and financial problems) and making appropriate referrals to specialists (namely, social workers, health educators, and SCD psychiatric clinics) have helped significantly in managing patients with OUD.

An important topic outlined in educational programs is pain assessment tools. Numerical pain scales as a tool for measuring the degree of pain have been widely used. For example, this method has been used by the American Pain Society since 1996 (pain as the 5th vital sign). Twenty years later, many researchers have found that these scaling tools directly contributed to America's opioid prescription epidemic, and efforts shifted towards developing a more objective assessment tool for pain severity.^{22,23} One tool is the functional activity scale (FAS), which measures the degree of activity limitation ("no" or "mild" or "severe" limitations) as a consequence of uncontrolled pain.^{24,25} During our study, we realized the inadequacy of numerical pain scales vis-à-vis opioid use, particularly for the super hospital utilizers, and started implementing a more objective, multidimensional pain scale that integrates functional activity and behavioral attitudes to pain. Some elements are the general appearance of the patient (namely, posture, facial expression, gait, mobility), sleep characteristics, behavior towards medical staff, and the pattern and quality of pain. Despite not being validated yet, this pain assessment tool has proven to be effective in determining the severity of pain and has helped significantly in subsequent management plans.

Establishing specialized clinics for SCD, including a pain/palliative care clinic and a SCD care clinic, was the transformation point in the ideal management of SCD patients with OUD. The main goal of the pain and palliative care clinic is to address all the dimensions of pain and to induce the highest possible functional capacity, taking into consideration the psychosocial and physical aspects of the patients. It is concerned with the proper assessment of pain using different tools, strict adherence to clinical guidelines, and the appropriate referral of patients when indicated. The clinic is responsible for closely following up and monitoring ER visits, admissions, and the opioid consumption of SCD patients with OUD who were not known to have regular follow ups at ordinary SCD clinics. The SCD care clinic (psychiatric clinic) has vital roles that include

the following: i) providing supportive psychotherapy to SCD patients and their caregivers; ii) improving the quality of life of SCD patients; 3) improving SCD patients' coping mechanisms to deal with the disease itself (including its various complications) and with pain (through patient education, cognitive therapy, behavioral therapy, and psychodynamic psychotherapy); iv) ensuring early diagnosis and proper management of any psychiatric disorders in SCD patients; v) ensuring the awareness of SCD patients not suffering from OD on the potential problem of OD (primary prevention); vi) ensuring the early detection of warning signs of OD in SCD patients; vii) diagnosing SCD patients who are suffering from OD; viii) providing a detoxification program to SCD patients suffering from OD; ix) detoxification includes 3 steps: a) evaluating patients to identify the opioids and amounts being used, assessing potential comorbid disorders, making dual diagnoses, and identifying behavioral or mental issues; b) stabilizing patients during the process of detoxification [mostly via pharmacotherapy], explaining to patients what to expect during treatment and recovery, and involving close caregivers to show support; c) guiding patients through the detoxification process to prepare them for the recovery phase, which includes motivating patients to complete the process by joining a rehabilitation program; x) supervising SCD patients suffering from OD during rehabilitation programs at other health facilities; xi) following up SCD patients who suffered from OD after rehabilitation programs to prevent relapses.

In addition to the above interventions, we largely attribute our successful management results to opioid prescription tracking and monitoring without compromising patient care. A qualitative study showed that restricting opioids may have negatively affected patients' care. Patients reported decreased opioid dosing, increased stigmatization regarding opioid use, physician preoccupation with opioid dosage interfering with comprehensive care, and lack of access to alternative therapies. This study concluded that patients with SCD should be included in establishing goals for managing pain and improving functionality using multimodality approaches.²⁶ Subsequently, we tried to engage the patients in decision making and management planning.

The process of tracking and monitoring opioid use was very strict, starting with prescribing the opioid analgesics through to the patients receiving them. The process included daily reports regarding SCD patients who visited the ER or who were admitted, including the reasons for visits or admissions; LOS; management plans and type and dose of analgesics received; and whether there were deviations from the guidelines. All

the reports were received, reviewed, and interpreted based on the standard guidelines by the MDT, which met on a regular basis.

Study limitations. Being retrospective is the main limitation of this study. In addition, this was a single hospital-based study that is subjected to selection bias, recommendations cannot be generalized due to this fact and due to small sample size. A prospective, multicenter study needs to be initiated in order to establish some more standard recommendations.

In conclusion, this intensive intervention strategy could not have been established without a dedicated MDT consisting of highly experienced health care providers. It is well known that multidisciplinary care for SCD patients provided in the context of a chronic care model can result in significant improvements in important quality targets and may reduce acute resource use.²⁷

Various factors contributed to the success of the MDT, including ease of patient access to the team, improved service coordination, the expedition of referrals, and direct supervision and authority. The most important benefits were treatment recommendations based on clinical information and multidisciplinary assessment, adherence to guidelines, increased team competence, and increased patient safety.

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