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Original Article

Effects of flexible management on accuracy and satisfaction of pre-examination and triage in outpatient orthopedics

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Abstract: Objective: To investigate the effects of flexible management (FM) on accuracy and satisfaction of pre-examination and triage (PET) in outpatient orthopedics. Methods: 340 patients admitted to the outpatient orthopedics prior to FM were included in the control group (CG), and given normal PET; 400 patients admitted after the application of FM were included in the study group (SG) and given FM. Accuracy differences before and after FM were compared, the causes of triage failure were analyzed, and patients' satisfaction with the service and medical staffs' satisfaction with their work were compared. Results: After FM, error rate of triage in the outpatient orthopedics decreased from 19.12% to 4.75% ($P<0.05$), and the cause analysis showed a decrease in human error from 35.38% to 26.32% ($P>0.05$); patients' satisfaction with the outpatient service increased from 80.00% to 94.50% ($P<0.05$), while medical staffs' satisfaction increased from 80.00% to 95.00% ($P<0.05$). Conclusion: FM can significantly improve the triage accuracy in outpatient orthopedics, and reduce human-induced failure of triage. Meanwhile, an increase was found in patients' satisfaction with the outpatient service and medical staffs' satisfaction with their work. Therefore, FM plays an important role in establishing a good physician-patient relation.

Keywords: Flexible management, outpatient orthopedics, pre-examination and triage, accuracy, satisfaction

Introduction

In recent years, with the development of industrialization and transportation, the morbidity of various orthopedic disorders has been increased. For instance, the social aging has brought a marked rise in osteoporosis and osteoarthritis, and fracture has been increased in injuries by falls and traffic accidents. These have increased the number of outpatients, resulting in high or even overload of the operation. For this reason, the American Academy of Emergency Medicine (AAEM) proposed the concept of "overcrowding" in 2006, and presented a shortage of medical resources against great demands on medical services. This is also the reality of outpatient orthopedics in China. "Overcrowding" could delay the severity evaluation, prolong hospital stays, increase patients' and family members' dissatisfaction on the medical service, increase patients' additional suffering, and even deteriorate patients' pathogenetic condition or the mortality. Meanwhile, "overcrowding" can also affect the mood and working efficiency of medical staffs, thus increasing the occurrence rate of malpractice and physician-patient disputes. In view of this, a scientific system of pre-examination and triage (PET) becomes very important to tackle the overcrowding and improve the outpatient orthopedics service [1-4].

Flexible management (FM) is based on theories of flexible management. As an intervening measure, it combines management method with production method for the flexible production system in enterprises. Unlike traditional management modes, the essence of FM is centered on people in a form of humanization management. This mode pays more attention to the

psychological and behavioral laws of participants, and generates potential persuasion upon the participants in a non-obligatory manner, thus transforming the will of the organizations into individual consciousness. In essence, FM emphasizes more on the management of "stability and change" [5-7]. Some of the researches on FM showed that the combination of FM and student management in the university contributed to the role of the school in education guidance, and unleashed students' activity and initiative in "self-education, self-service and self-management", and finally achieved the real education management. At the same time, FM can also help cultivate students' initiative and innovation, and promote their all-around development [8, 9]. Other studies have shown that FM motivated medical staffs to effectively communicate and coordinate with other departments to provide patients with more satisfactory comprehensive health service [10]. In this study, triage accuracy and patients' satisfaction of the outpatient orthopedics before and after FM were compared, and feasibility of FM in PET was analyzed to lay a good foundation for building a harmonious physician-patient relationship.

Materials and methods

Normal materials

740 patients admitted to the outpatient orthopedics from January to December 2019 were selected as the object of study, and there were 40 medical staffs from the outpatient, including 15 physicians and 25 nurses. The 740 patients, as per the criteria of FM, were divided into the study group (SG) (from July to December 2019, after FM) and the control group (CG) (from January to June 2019, before FM). This study has been approved by the Ethics Committee of Nanfang Hospital, Southern Medical University. All study participants provided written informed consent prior to participating in the study.

Intervention methods

Before the application of FM, traditional PET was carried out. Twenty-five nurses were divided into 4 levels as per the Level Standards Zoning (chief/co-chief superintendent nurse, supervisor nurse, senior nurse and nurse). Professional medical staffs took charge of PET in turn in the outpatient orthopedics every day and carried out routine work.

After FM, traditional PET was combined with FM measures as follows: (1) FM procedures were formulated and access standards for triage staff were improved. Both the orthopedics and the nursing departments studied and formulated the access standards for triage nurse, improved the PET system, and sent the draft to the outpatient orthopedics for consultation and revision. PET system mainly included the work target, access conditions, friendly training and procedures etc.; its main aim was to establish a decision means based on consultation. Oversight on nursing quality was normalized to avoid the formalistic examination. The oversight authority was delegated to each medical staffs so that they can timely find out the shortcomings in their daily work, and make efficient communication with the head nurse or triage nurses, thus forming a friendly, interactive and innovative relation, and transforming management into service. The work of triage nurses was no longer shift work, but in the charge of staffs with strong responsibility and communication competence with over 3 years of experience in clinical nursing. These medical staffs had a professional title of nurse or above, received capability assessment and reached the standard before taking the post. (2) A mode of level management and democratic scheduling was carried out under the principles of "junior and senior medical staffs co-work, technical skills of various levels were combined, and communication capabilities were matched", aiming at achieving work targets and the gradient talent construction. During peak working hours, one or two more nurses were added to the PET post to guarantee smooth progress and reduce patients' waiting time. In addition, a suggestion box was set up for medical staffs' suggestions and ideas in an anonymous way, thus showing respect and care for the details of the work. (3) Triage equipment was distributed as per standard. The required medical devices were determined through the questionnaires and seminars, and were assigned to the PET post according to the standard. Managements of medical devices were complemented with the "Five-Fix and Two-In-time" principle scheduled for the ambulance, and got replenished in time. (4) FM training was normalized. Outside experts were invited to make professional interpreta-

Table 1. PET criteria in the outpatient orthopedics

Class	Specific performance	Triage measures
I Class (Severe)	Vital signs are instable, with cardiopulmonary arrest, shock, severe craniocerebral injury, extremity disconnection, coma and endotracheal intubation etc.	Green channel is launched for ICU rescue immediately
II Class (Critical)	Vital signs are instable with potential life risks. There is massive bleeding by open fracture, spinal fracture, high-energy blast injury and palsy etc.	Intensive vital signs monitoring is carried out with prior admittance (≤5 min)
III Class (Emergency)	Vital signs are stable, but the patients' conditions are bad with potentials for deterioration	Prior admittance is given as per the emergency procedures (≤30 min), and the pathogenetic condition is assessed regularly (10 min)
IV Class (Normal)	Vital signs are stable with no life risks.	Normal registration is arranged

tion on concepts, detailed measures and key points of FM, and related trainings were held for medical staffs' communication ability. (5) Triage standards were established, and the concept of people-oriented management was built. PET standards of the outpatient orthopedics were set up through literature review and consultation (See **Table 1**). Nurses' work on the PET post was checked monthly, and management in forms of education, persuasion and influence was adopted from a viewpoint of care, respect and understanding. Problems were solved together with the staff, instead of criticism and punishment. Besides, medical staffs were trained to develop a deep understanding of management policies and rules, thus unleashing their vitality and motivation.

Observation indicator and assessment criteria

Triage accuracy in the outpatient orthopedics before and after FM: Triage accuracy in the outpatient orthopedics before and after FM was collected, respectively. Triage error zone was divided into two categories of missed diagnosis and misdiagnosis. The missed diagnosis rate and the misdiagnosis rate were counted, respectively, the total error rate was calculated, and the differences between the two groups were compared.

Reason analysis of triage error before and after FM: Responsibility zone of the triage error was divided into four aspects of triage staff (medical staffs), patients and family members, disease and hospital management; the triage error ratios were counted, respectively.

Patient satisfaction assessment on outpatient orthopedics before and after FM: The patients' satisfaction with the service was evaluated by the self-made 100-point nursing satisfaction scale, which included 10 items of service attitude, problem settlement, suggestions, etc. 90-100 points indicate "very satisfied", 70-89 points indicate "satisfied", 69 points and below indicate "dissatisfied". Satisfaction = ("very satisfied" counts + "satisfied" counts)/total counts × 100%.

Staff satisfaction assessment on work before and after FM: The staffs' satisfaction with work was evaluated by the self-made 100-point nursing satisfaction scale, which included 10 items of working environment, suggestion adoption, rules and regulations, incentive system, etc. 90-100 points indicate "very satisfied", 70-89 points indicate "satisfied", 69 points and below indicate "dissatisfied". Satisfaction = ("very satisfied" counts + "satisfied" counts)/total counts × 100%.

Statistical analysis

Data were recorded into the SPSS20.0 software for statistical analysis, and measurement data were presented in ($\bar{x}$ ± sd); difference comparison between groups were verified by the Student's t test, and enumeration data were presented in [n (%)]. Chi-square test was adopted for the difference comparison. $P<0.05$ was considered as statistical significance [11].

Results

Clinical data comparison between the two groups

The normal clinical data of the two groups showed no statistically significant difference in gender, age, pathogenetic condition, underlying disease, BMI, etc., which were comparable ($P>0.05$) (**Table 2**).

Comparison of triage accuracy in the outpatient orthopedics before and after FM

Before FM, the missed diagnosis rate was 12.94%, the misdiagnosis rate was 6.18% and

Table 2. Comparison of normal clinical data between the two groups ($\bar{x} \pm sd$)/[n (%)]

Normal clinical data		SG (n=400)	CG (n=340)	t/X^2	*P*
Gender	Male	231	178	2.165	0.141
	Female	169	162		
Average age (years)		40.28±3.44	39.89±3.56	1.512	0.131
Average weight (kg)		64.19±4.44	64.51±4.01	1.021	0.308
Average BMI (kg/m^2)		23.28±3.21	23.19±3.09	0.387	0.699
Education level	Illiteracy	32	28	0.343	0.527
	Primary school	78	62		
	Middle school	110	120		
	High school and above	180	130		
Marital status	Married	368	310	0.162	0.687
	Not married	32	30		
Hypertension	Yes	41	30	0.431	0.511
	No	359	310		
Diabetes	Yes	50	50	0.765	0.382
	No	350	290		

Table 3. Comparison of triage accuracy in the outpatient orthopedics before and after FM [n (%)]

Group	Number	Missed diagnosis	Misdiagnosis	Error rate of triage
SG	400	13 (3.25)	6 (1.5)	19 (4.75)
CG	340	44 (12.94)	21 (6.18)	65 (19.12)
X^2	-	24.279	11.433	37.702
P	-	<0.001	0.001	<0.001

the total diagnosis error rate was 19.12%. After FM, the missed diagnosis rate was 3.25%, the misdiagnosis rate was 1.50% and the total diagnosis error rate was 4.75%. The difference of the diagnosis error rates between the two groups was statistically significant (*P*<0.05) (**Table 3**).

Comparison of causes of triage error before and after FM

Reason analysis showed that, before FM, for triage error in the CG patients, the triage staffs accounted for 35.38%, patients and family members accounted for 27.69%, diseases accounted for 23.08% and hospital management accounted for 13.85%. After FM, for triage error in the SG patients, the triage staffs accounted for 26.32%, patients and family members accounted for 26.32%, diseases accounted for 26.32% and hospital management accounted for 21.05%. The comparison showed a significant decrease in the human factor (P<0.05) (**Table 4**).

Comparison of patient satisfaction with outpatient service before and after FM

Before FM, the rate of "very satisfied" patients was 49.71%, "satisfied" was 30.29%, "dissatisfied" was 20.00%, and the overall satisfaction was 80.00%. After FM, the rate of "very satisfied" was 69.00%, "satisfied" was 25.50%, "dissatisfied" was 5.50%, and the overall satisfaction was 94.50%. The two groups showed notable difference (*P*<0.05) (**Table 5**).

Comparison of staff satisfaction with work before and after FM

Before FM, the rate of "very satisfied" medical staffs was 30.00%, "satisfied" was 50.00%, "dissatisfied" was 20.00%, and the overall satisfaction was 80.00%. After FM, the rate of "very satisfied" medical staffs was 55.00%, "satisfied" was 40.00%, "dissatisfied" was 5.00%, and the overall satisfaction was 95.00%. The two groups showed marked difference (*P*<0.05) (**Table 6**).

Discussion

In recent years, with the improvement of living standards and the development of industrial construction and transportation, people's demand for medical and health service is increasing. However, limited medical resources cannot meet this demand, and the contradiction is finally presented as the overcrowded outpatient. The dilemma strains the relation-

Table 4. Comparison of causes of triage error before and after FM

Reason	CG (n=65)		SG (n=19)	
	Error counts	Error ratio (%)	Error counts	Error ratio (%)
Triage staff	23	35.38	5	26.32
Patients and family members	18	27.69	5	26.32
Disease	15	23.08	5	26.32
Hospital management	9	13.85	4	21.05
Sum	65	100.00	19	100.00

Table 5. Comparison of patient satisfaction with the outpatient orthopedics service before and after FM

Group	Number	Very satisfied	Satisfied	Dissatisfied	Satisfaction
SG	400	276 (69.00)	102 (25.50)	22 (5.50)	378 (94.50)
CG	340	169 (49.71)	103 (30.29)	68 (20.00)	272 (80.00)
X^2	-	28.539	2.109	36.17	36.17
P	-	<0.001	0.146	<0.001	<0.001

Table 6. Medical staff satisfaction comparison on work before and after FM [n (%)]

Group	Number	Very satisfied	Satisfied	Dissatisfied	Satisfaction
SG	40	22 (55.00)	16 (40.00)	2 (5.00)	38 (95.00)
CG	40	12 (30.00)	20 (50.00)	8 (20.00)	32 (80.00)
X^2	-	-	-	-	4.114
P	-	-	-	-	0.043

ship between patients and the hospitals, and prolongs the average waiting time. This is adverse to people's livelihood and hampers the construction of a harmonious physician-patient relation. Therefore, exploring an efficient outpatient system becomes important for the health care workers [12].

The PET system was first applied in the US military in the 1950s, and was later spread in medical institutions. This system was originally performed by doctors and transferred to nurses in 1960s. In the 1990s, Australia pioneered to formulate National Triage Scale (NTS), which was later renamed as Australia Triage Scale (ATS). In the middle 1990s, Canada created Canadian Triage and Acuity Scale (CTAS) based on the studies of Australia, and the U.K. also set forth Manchester Triage Scale (MTS), followed by the America establishing 5-level PET system with Emergency Severity Index (ESI) in the late 1990s [13, 14]. PET started relatively late in China, and it was not given much attention to until 1987 that the emergency nursing system was gradually developed. Nowadays, this system has been widely used in most of the medical institutions in China, and served as a first step for most patients [15, 16]. Some studies have highlighted the special role of the outpatient in hospitals with its focus on service, coordination and management. The outpatient serves to leave patients a first impression on the hospital, and its service quality directly affects the subsequent medical work [17]. The traditional PET system was quite rigid, and the stringent management may guarantee continuity of the work to some extent. However, some medical staffs were resistant or against it. Furthermore, medical staffs have to risk direct physical contacts with patients in the course of PET, and this would degrade the service quality and affect work efficiency and precision. For this, the PET system should be further improved [18].

FM is humanistic and it centers on people. On the basis of individual behaviors and psychological laws, FM builds its potential persuasion and authority among the staffs in a non-obligatory manner, and transfers the will of the organization into individual driving force. FM is mainly characterized by human-based management. Great advancements of the management science in recent years was largely attributed to the development of society and liberalization of thought, and management objects of the outpatient service have also gradually shifted to doctors and nurses with a high level of education. Such talents tend to pay more attention to individual values and personal significance, therefore, the traditional management system has gradually exposed its shortcomings [19-

21]. In this study, different forms were grouped, and FM was used to assess PET accuracy and patients' satisfaction with the outpatient orthopedics service. Results showed that the missed diagnosis rate and the misdiagnosis rate in the SG patients with FM were significantly reduced as compared with the CG patients without FM, and the triage error rate was reduced from 19.12% to 4.75%. The analysis further revealed that the proportion of triage staff in the triage error decreased from 35.38% to 26.32%, suggesting that FM can significantly reduce the error rate of PET, mainly due to the reduction of the error rate of triage staff. Some studies have pointed out that the outpatient triage system is an indispensable part of medical service and also an important procedure for patients to receive medical services. However, less qualified medical staffs are prone to confusion in the face of the disease differentiation and fail to make a right judgment due to the lack of necessary triage knowledge, thus increasing the triage error rate. Subsequently, these medical staffs are frustrated in the face of criticism from the head nurse, further affecting the long-term implementation of the triage system [22]. In this study, it is believed that FM is characterized as the following traits: (1) FM has endurance of its effects. Unlike the previous rigid management, FM focuses more on medical staffs' subjective initiative; it requires transformation from rigid requests into inner autonomous promise, and then self-consciousness and enthusiasm, and finally uniforms the goal of the organization with individual target. (2) FM has inner motivation. It emphasizes the inner motivation of nurses to achieve goals, rather than external constraints. By activating the inner potential, motivation and innovation, the rules of the organization are finally transformed into nurses' consciousness. (3) FM has availability of its incentive mechanism. FM is based on the Maslow's hierarchy of needs; it keeps the achievement of nurses' individual values as the target, and raises the management goal from a level of sheer material to spirit. With the above three characteristics, FM can stimulate the inner motivation of nurses, and energize their enthusiasm and innovation in work. Besides, the study also specified the triage criteria and laid a foundation for the development of PET, thus making a progress in improvement of the triage error.

Effects of FM on satisfaction of the patients and the medical staffs were also analyzed. The results showed a significant increase in patients' satisfaction with nursing service and medical staffs' satisfaction with their work with the application of FM. In this study, it is believed that FM has changed the previous concept of "finishing task" as the center. Nurses' suggestions and opinions were given space and access through training, learning and consultation etc., and their enthusiasm was fully stimulated under the democratic management. They were enabled to be involved in department management and triage work, therefore greatly improving the work quality [23]. In turn, progress in service was directly reflected in the satisfaction of patients with hospital care. As a result, medical staffs are more satisfied with their work and get more recognition from the patients.

In summary, the application of FM in PET for the outpatient orthopedics can significantly improve the triage accuracy, reduce triage error caused by human factors, and improve patients' satisfaction with both the outpatient service and medical staffs' work. This brings great significance to the construction of a harmonious physician-patient relationship. Further work is still required in the future: (1) the effects of FM on PET were only carried out in the outpatient orthopedics, and the limitation is obvious; (2) there was a lack of follow-up visits to the participants. Therefore, it is necessary to carry out a specific investigation with a larger sample, a wider sampling and longer follow-up time, so as to lay a theoretical foundation for the application of PET in the outpatient.

Disclosure of conflict of interest

None.

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