

# Application of Project Improvement in Elevating the Qualified Rate of Retained 24-h Quantitative Urinary Protein Specimens Among Children

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**Abstract:** Objective To explore the effect of project improvement in elevating the qualified rate of retained 24-h quantitative urinary protein specimens among children in our hospital's Department of Pediatric Internal Medicine. Methods A project improvement team was set up. The 24-h quantitative urinary protein specimens of 61 pediatric patients collected from January to June 2021 were included in the control group. From the 5 aspects of "people, devices, materials, methods, and environment", the causes underlying the unqualified 24-h quantitative urinary protein specimens were analyzed, and the major causes were discussed. Accordingly, feasible improvement measures were formulated and implemented by department staff. After that, the 24-h quantitative urinary protein specimens of 51 pediatric patients retained in our department from July to December 2021 were included in the observation group. Finally, a comparison was made between the qualified rates of retained specimens of the two groups. Results Following project improvement, the qualified rate of retained 24-h quantitative urinary protein specimens was obviously lifted from 78.7% to 94.1%. The difference was statistically significant ( $P < 0.05$ ). Conclusion Nursing project improvement is able to effectively elevate the qualified rate of retained 24-h quantitative urinary protein specimens. With the wisdom of the project improvement team, science-based approaches were adopted to address the clinical nursing issue and enhance the nursing quality. In this way, continuous quality improvement can be achieved, which in turn can make children and their family members feel more satisfied.

**Keywords:** Project Improvement, 24-h Quantitative Urinary Protein Specimens, Qualified Rate

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## 1. Introduction

Proteinuria is a clinical manifestation of multiple kidney diseases and is therefore an important indicator for the diagnosis, treatment and therapeutic efficacy evaluation of kidney diseases. As a significant marker for impaired kidney functions, proteinuria can induce glomerulosclerosis and expedite the progression of kidney diseases [1]. The 24-h urinary protein quantification, which can best reflect the 1-day protein loss of patients, is an indispensable monitoring indicator for patients with kidney diseases, and is also the gold standard for urinary protein measurement [2-7]. Correct, timely, and standardized collection and submission of urinary specimens can potentially ensure the pre-analysis quality of

these specimens. In our hospital's Department of Pediatric Internal Medicine, the 24-h quantitative urinary protein specimens should be retained from the majority of the children with kidney diseases. However, due to the long duration of specimen collection, weak awareness of nurses, children's lack of subjective awareness, and frequent altered family members, it is easy to make errors in specimen retention, which can result in the inability to submit specimens for testing in a timely manner, specimen re-collection [8], and even the inconsistency between testing results and clinical manifestations, thereby disturbing the judgments of physicians and delaying the treatment [5]. In the meanwhile, the workload on nurses is increased, and physician-patient conflicts are intensified, leading to lower nursing quality.

Nursing project improvement refers to the systematical control and analysis on specific nursing subjects for the achievement of specific goals [9-11]. It is also a science-based tool for the improvement of nursing quality that has recently been thought highly of and widely applied in the nursing field of Taiwan, China [12-14]. In this context, a project improvement team was set up in our department in January 2021 to conduct systematic analysis and planning, and to provide full-course quality management. Besides, the specifications for 24-h quantitative urinary protein specimen retention were stipulated, which effectively enhanced the qualified rate of retained specimens. The rectification processes and results are demonstrated below.

## 2. Materials and Methods

### 2.1. General Materials

A total of 61 children (boy,  $n = 39$ ; girl,  $n = 22$ ) in our department whose 24-h urinary proteins needed to be retained during the hospital stay from January to June 2021 were selected in the control group. Aged from 3-12 years, they were suffering from purpura nephritis, nephrotic syndrome, lupus nephritis or renal failure.

### 2.2. Methods

#### 2.2.1. Establishment of the Project Improvement Team

In January 2021, a project improvement team was set up in our department. The head nurse was the team leader responsible for offering guidance and supervision; two accountability leaders were in charge of the planning, implementation, inspection, summarization and analysis of all tasks; one liaison was appointed to inspect data collection; and five other team members were involved in data collection, the implementation of each step, and problem feedback.

#### 2.2.2. Subject Determination and Task Planning

The subject of project improvement, determined using the evaluation method, was to elevate the qualified rate of the retained 24-h quantitative urinary protein specimens of children. Additionally, a task schedule was made.

#### 2.2.3. Subject Definition

When all the collection requirements (urinary retention duration, recording of total urinary volume, suspension/sediment, and specimen vessel) for tests were met, the retained specimens were considered to be qualified. The qualified rates of 24-h urinary specimens were presented in percentages.

$$\text{Qualified rate (\%)} = \frac{\text{number of qualified 24-h urinary protein specimens}}{\text{total number of 24-h urinary protein specimens}} \times 100\%$$

#### 2.2.4. Data Collection and Analysis

A register of retained 24-h urinary protein specimens was prepared. The accountability team leaders recorded the information of children whose 24-h urinary protein specimens should be retained. The liaison, by carrying out question

surveys on the staff of the Department of Laboratory Medicine every week, inquired about the qualification of the retained 24-h urinary specimens and their satisfaction with the specimens. The reasons underlying the unqualified urinary specimens were obtained by current status surveys and recorded on check sheets. Among the 61 24-h urinary protein specimens from the included children, 48 (78%) were qualified and 12 (22%) were unqualified. Based on the Pareto principle (80/20 rule), the reasons for unqualified specimens included insufficient urine volumes, specimen contamination, and poor awareness of nurses.

#### 2.2.5. Target Setting

Target value of project improvement = current status value + [(1 - current status value)  $\times$  improvement priority  $\times$  circle capacity] = 78% + [(1-78%)  $\times$  80%  $\times$  92%] = 94%. Hence, the target qualified rate of 24-h urinary protein specimens was finally set at 94%.

#### 2.2.6. Cause Analysis

The two improvement priorities were analyzed in a fishbone diagram from 4 aspects: environment, methods, materials, and people. Ten major causes were identified through the evaluation table of major causes. After a check sheet for the 6 major causes was made, data were collected again for true cause verification and a Pareto chart was plotted. Finally, a total of 3 true causes for the low qualified rate of 24-h urinary protein specimens were identified, including “lack of knowledge of nurses”, “single mode of education”, and “failure to provide continuous supervision”. The causes for unqualified 24-h urinary specimen retention are listed in Figure 1.

#### 2.2.7. Planning and Implementation

After pooled analysis, targeted measures were developed.

##### (i). Training Intensification

We investigated nursing staff's mastery of the significance regarding the retention of 24-h quantitative urinary protein specimens, factors affecting specimen qualified rates, and the correct approaches of specimen retention. The process of specimen collection and retention was optimized and revised, and centralized training was implemented in the form of feedback education, during which on-site assessment was given by accountability leaders to ensure a mastery rate of 100%.

##### (ii). Education Diversity

From the single mode of verbal interpretation, the educational approach was advanced to a combination of verbal and written instruction. If the children had more than one family members, they should be invited for education together. The three-step educational strategy of verbal interpretation, written instruction, and family member retelling should be implemented. During the process, nurses needed to inform the retention methods and precautions in easy-to-understand language, and correct the mistakes made by the family members during their retelling process.

### (iii). Quality Control of Each Step

An eye-catching specimen retention sign was made and hung on the head of the bed, and a management list of the 24-h urinary protein specimen was formulated and put on the foot of the bed. The following items were included in the list: purpose and method of specimen retention, retention duration, precautions of specimen retention (such as avoiding the inclusion of stools or foreign bodies, and avoiding the menstrual period), and precautions of specimen collection (such as shaking the collected specimen thoroughly and recording the total urine volume on the specimen vessel). After team members handed out the lists, they should interpret the items of the management list together with children's family members, and the completed items should be marked with "√". During each shift, the team members should check the specimen retention status and sign as required, and accordingly provide treatment and education based on the status of specimen retention.

### 2.2.8. Review

The team leader checked weekly on registration and implementation of various measures, and the accountability leader asked the children's family members to finish questionnaires to evaluate the retention quality of urinary protein specimens. A performance protocol was established, and the responsibilities of each team member were definitely clarified. Every month, the medical staff in our department were organized to analyze and discuss the causes of errors, and formulate rectification measures, so as to enter a new cycle of quality control.

### 2.3. Statistical Methods

SPSS 22.0 was applied for analysis with the enumeration data expressed as rates (%). The  $\chi^2$  test was conducted. The difference was statistically significant when  $P < 0.05$ .

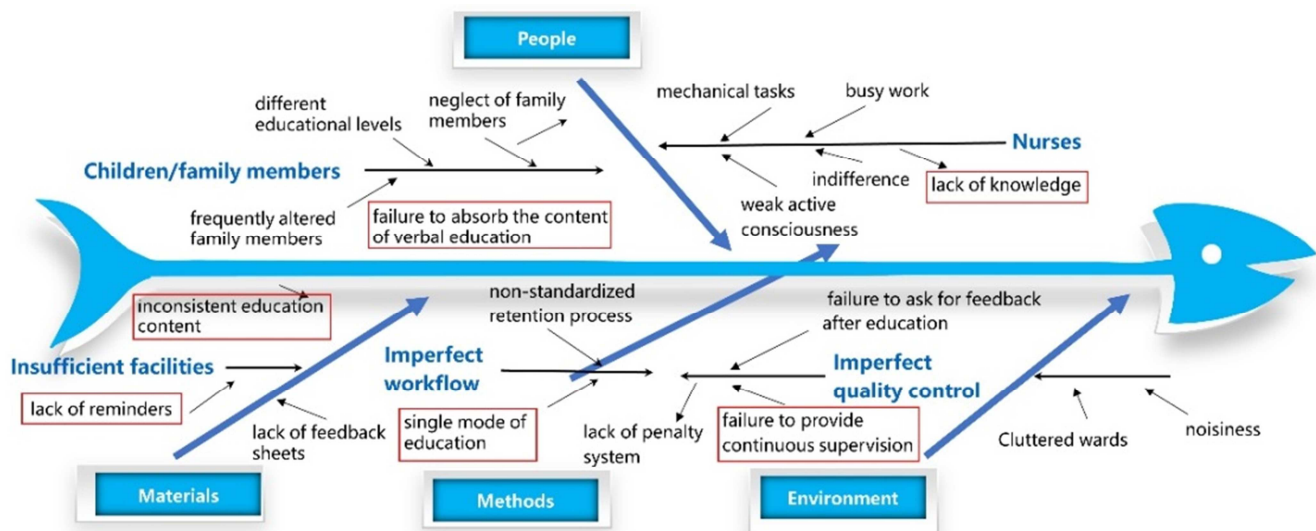


Figure 1. Causes for unqualified 24-h urinary specimen retention.

## 3. Results

From July to December 2021, fifty-one 24-h urinary protein specimens (the observation group) were retained in our department, 3 of which were unqualified with insufficient urine volume because 2 children were taken out for examinations and the relief family member of 1 child forgot about the retention. Finally, the qualified retention rate was 94.1%. The comparison of qualified rates of 24-h quantitative urinary protein specimens before and after project improvement is shown in Table 1.

Table 1. Inter-group comparison of qualified rates [n (%)].

Group	Cases	Unqualified	Qualified
Control	61	13 (21.3)	48 (78.7)
Observation	51	3 (5.9)	48 (94.1)
$\chi^2$	5.4		
$P$	0.02		

## 4. Discussion

As a science-based approach to improve nursing quality, nursing project improvement is designed to analyze and control a specific subject of nursing in an organized manner and develop corresponding solutions, so as to realize specific targets [9, 14]. The implementation of project improvement is able to ensure nursing quality, enhance the efficiency of clinical work, and reinforce patient compliance. Based on all-round quality management, project improvement attaches greater importance to the quality control of processes and steps, continuously enhancing the quality and constantly meeting the requirements of improved cyclic activities [8, 15]. In the current research, a project improvement team was established to optimize the retention of 24-h urinary protein specimens. With the joint involvement of nursing staff and family members throughout quality control process, as well as the full-course management mode achieved by checklist

during every shift and the eye-catching signs, the unqualified specimens caused by specimen contamination or family member's obliviousness were reduced. The previously single mode of education (oral only) was enriched by written instruction, enabling the family members to learn the process in a clearer and more intuitive way, and to cooperate with the staff to complete the collection of specimens.

With project improvement, the qualified rate of the retained 24-h urinary protein specimens was effectively lifted. The participation of all staff also helped them to gradually develop the concept of self-monitoring as well as self-management, and to strengthen the collaborative ability of the team [6]. Moreover, as teamwork was required in project improvement, the cohesiveness of the team was enhanced, and staff's capacities of identifying, analyzing, and solving problems were also improved.

## 5. Conclusion

With the wisdom of the project improvement team, science-based measures were proposed from the 5 aspects of "people, devices, materials, methods, and environment", which apparently elevated the qualified rate of the retained 24-h quantitative urinary protein specimens, thus settling a clinical nursing problem and enhancing the nursing quality. In this way, continuous quality improvement can be achieved, which can in turn make children and their family members feel more satisfied. In the future, multi-center and large sample research will be conducted in different regions, so as to obtain more real and effective data and further improve the qualified rate.

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