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Patient care and safety enhancement in emergency and critical care through summary of diagnostic tests chart

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Abstract

Background

Health care providers should share diagnostic test results as soon as possible to ensure patient safety. In an emergency or critical care setting, however, it may not always be possible to follow up on or communicate diagnostic work-up results in a timely manner. This institution has developed a Summary of Diagnostic Tests (SDT) chart including items such as post-placement X-ray confirmation of central lines and tracheal tubes with the aim of enhancing communication and patient safety. This chart was originally created to facilitate information exchange among nursing staff. After it was first implemented, however, it was realized that nursing staff sometimes had to verbally ask physicians about the results of diagnostic tests which had not been documented. Thus, the SDT may have taken on an unexpected role as a safety measure.

Objectives

To investigate the effectiveness of the SDT as a double-check mechanism based on provider perception and to determine which human factors contribute to its effectiveness in enhancing patient safety.

Methods

Cross-sectional survey of data collected from nurses and physicians by questionnaire.

Results

All nurses and physicians surveyed indicated that the SDT functioned as an effective reminder for physicians to review diagnostic test results. The answers also suggested that test results are not immediately reviewed by physicians or communicated to nurses on many occasions, and that the physician's attitude toward the SDT varied. The estimated effectiveness of the SDT as a reminder was positively associated with provider objectives, particularly that of enhancing communication and teamwork.

Conclusion

The SDT could improve the quality and safety of patient care by serving as a reminder to staff to review test results. The attitude of the provider toward the SDT, especially with regard to enhancing communication and teamwork, appears to have strong implications for its effectiveness.

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Introduction

The timely follow-up on and interpretation of diagnostic test results are crucial in patient care. In a highly dynamic and short-staffed clinical setting such as an emergency department or intensive care unit, however, it is not always possible for the physician to follow up on tests results on a timely basis, especially when there is no automatic alarm system to inform them of the availability of those results.

Physicians at our institution sometimes fail to immediately document test results or verbally communicate them to nurses due to the pressures of working in an intensive care setting. In an attempt to overcome this problem, the nursing staff proposed and implemented a Summary of Diagnostic Tests (SDT) chart for in-patients to record test results in simplified terms (Table 1). The SDT includes the following information : the test date (and time in some cases) ; type of test ; the name of the doctor who interpreted the results ; the name of the nurse who confirmed the results ; and an outline of the results themselves. Quite frequently, on-call doctors must treat multiple patients concurrently, and are therefore too busy to be able to immediately document or communicate such information to the nursing staff unless it is considered urgent. Nurses thus usually only contact the doctors when they realize the need to be made aware of those results.

The original concept behind the SDT was therefore to allow nurses to compile and retrieve such information without having to consult the doctors' charts. Each incoming shift of nurses is able to refer to these summaries as they form part of the bedside medical record. These summaries have proven to be beneficial as they 1) enable nurses to confirm whether a doctor has reviewed the test results ; 2) incur no additional cost ; 3) help nurses to quickly grasp the clinical course of a patient at the bedside ; and 4) usually do not take up a significant amount of time.

The number of interns rotating in our emergency unit is increasing, and the SDT has played a beneficial role in maintaining the quality and safety of patient care by enabling nurses to prompt physicians, particularly interns who are not yet familiar with what is expected of them. However, some interns appear to be unaware of the effectiveness of these summaries and indifferent to their use by the nursing staff.

The role of the SDT and its effectiveness remain to be determined. Therefore, the purpose of this study was to survey our hospital staff and physicians by questionnaire to investigate the usefulness and effectiveness of the SDT in helping improve the quality and safety of patient care.

Methods

This study on the SDT comprised a cross-sectional survey of data collected by questionnaire from nurses and physicians. The questionnaire itself was developed based on the observations of providers and interviews with physicians and nurses from the Departmental Safe Practice Committee. The questionnaire was reviewed by all the staff physicians and a statistical expert regarding the measurability and relevance of all included items. This study was approved by the institutional review board of our institution.

A total of 87 medical professionals (56 nurses and 31 doctors) from the Emergency Department and Critical Care Unit of this institution, a 1000-bed university hospital in Japan, were enrolled in the study. All participants worked exclusively at this institution at the time of the survey, and no floating or temporary nurses participated.

Participants received an explanation of the study before answering the questionnaire (Table 2). All participants understood that their participation in the survey was on a purely voluntary basis. Any questions from the participants were answered by the survey conductor, and the participants were asked to complete the survey in their own time. Participants were required to choose 1 answer from among multiple choices for each of questions (1) to (4).

In Question (1), the participants were asked to choose the answer that most closely matched their estimated probability (p) for each of the following 3 situations : (a) the doctor, when asked by a nurse, had already checked the test results ; (b) the doctor, when asked by a nurse, had not checked the test results, but another doctor had ; and (c) no doctor had checked the test results, or it is not known if someone had checked them.

Table 1 Sample Summary of Diagnostic Tests (SDT) chart

Patient name : Taro Tokyo (ID 9999-999-9)

Type of test	Test date	Findings	Physician	Nurse
Chest X-ray	2010/12/24	Tracheal tube is in good position. No acute process.	Dr. A	Ns B
ECG	2010/12/24	Sinus rhythm	Dr. A	Ns B
CT head	2010/12/24	Acute left basal ganglia infarction.	Dr. C	Ns D
Chest X-ray	2010/12/25	CV line is in good position.	Dr. E	Ns D

Table 2 Sample Questionnaire

Q(1) Which answer most closely matches your estimated probability for each of the following situations :
(a) The doctor, when asked by a nurse, had already checked the test results.
(b) The doctor, when asked by a nurse, had not checked the test results, but another doctor had.
(c) No doctor had checked the test results, or it is not known if someone had checked them.
(0) 0% ; (1) 0%< $p \leq$20% ; (2) 20%< $p \leq$40% ; (3) 40%< $p \leq$60% ; (4) 60%< $p \leq$80% ; (5) 80%< $p <$100% ; (6) 100% ; (7) I have no idea.

Q(2) Which answer most closely matches your estimated probability that doctors would voluntarily convey their interpretation of test results to nurses before being requested to do so by the nurses ?
(0) 0% ; (1) 0%< $p \leq$20% ; (2) 20%< $p \leq$40% ; (3) 40%< $p \leq$60% ; (4) 60%< $p \leq$80% ; (5) 80%< $p <$100% ; (6) 100% ; (7) I have no idea.

Q(3) Which answer indicates the extent of utilization of the summary for each of the following objectives :
(a) To help understand patients' medical issues and interpretation of radiological studies.
(b) To provide information to other medical professionals and patients' families.
(c) To enable communication and teamwork among physicians and nurses.
(d) To brief the staff of the incoming shift.
(e) To supplement the charts written by physicians.
(0) not at all ; (1) hardly ; (2) to some extent ; (3) considerably ; (4) to a great extent.

Q(4) Which answer matches the degree of effectiveness of the summary for each of the following objectives :
(a) To help understand patients' medical issues and the interpretation of radiological studies.
(b) To provide information to other medical professionals and patients' families.
(c) To enable communication and teamwork among doctors and nurses.
(d) To brief the staff of the incoming shift.
(e) to supplement the charts written by doctors.
(f) To remind doctors to check study results.
(0) not at all ; (1) hardly ; (2) to some extent ; (3) considerably ; (4) to a great extent.

In Question (2), the participants were required to select the answer that most closely matched their estimated probability (p) that doctors would voluntarily convey their interpretation of test results to nurses before being requested to do so by those nurses.

In Question (3), the participants were asked to choose the answer that most closely indicated their estimated extent of utilization of the SDT for the following objectives : (a) to help understand patients' medical issues and interpretation of radiological studies ; (b) to provide information to other medical professionals and patients' families ; (c) to enable communication and teamwork among physicians and nurses ; (d) to brief the incoming shift ; and (e) to supplement charts written by physicians.

In Question (4), the participants were required to select the answer that most closely indicated their estimation of the degree of effectiveness of the SDT for each of the objectives described in Question (3).

The data were collected between November 2010 and February 2011. Of 87 recruited medical staff, 64 completed the questionnaire. Of these, 37 were nurses and 27 were physicians. The participants answered anonymously, but identified their job title.

The distribution and descriptive characteristics of the data were analyzed and cross-tabulated for the final evaluation.

The Spearman rank correlation coefficient was used to determine covariance between the participants' answers to Q(3) and Q(4) to establish whether there was a relationship between providers' estimation of the effectiveness of the SDT and their objectives in using it.

All analyses were conducted using the statistical software package SPSS v. 17.0 (SPSS Ltd., Chicago, IL, USA).

Results

Answers to the questionnaire were analyzed and the following results obtained :

Q(1), regarding how often physicians checked test results before being asked.

The median of the estimated probabilities for all of the participants fell within the range of 40%< $p \leq$60% for all 3 scenarios, suggesting that the physicians have often not yet reviewed or communicated test results to other providers before being asked to interpret them by nursing staff.

Q(2), regarding the status quo of communication.

Here, the participants were asked how often they thought physicians conveyed their interpretation of findings to nursing staff before being asked. The results revealed that the median probability was within the range of 20%< $p \leq$40% in the physician group, which was higher than that in the nurses group at 0%< $p \leq$20%. This implies that physicians do not play a proactive role in communicating test results to nurses.

Q(3) Purpose of use of SDT by staff.

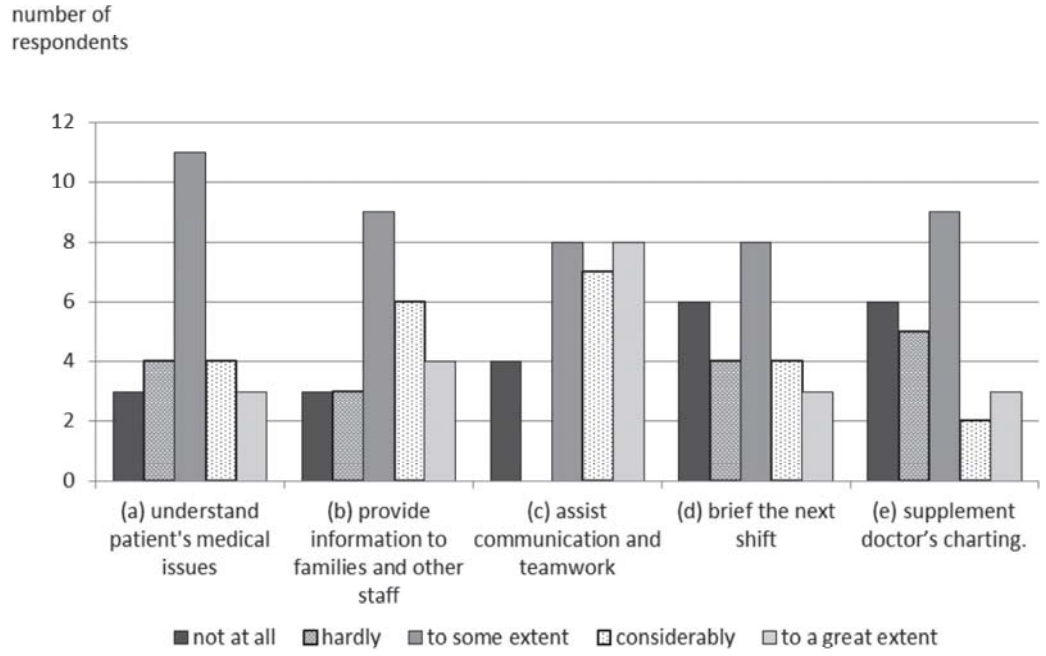

Fig. 1 Summary of SDT objectives for physicians

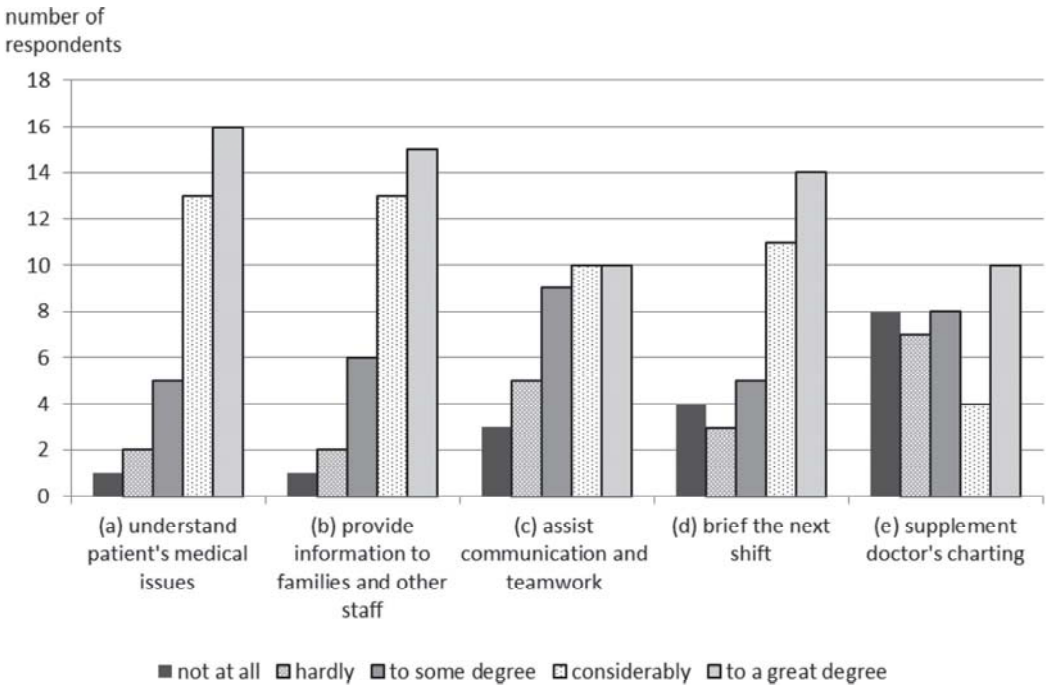

Fig. 2 Summary of SDT objectives for nurses

Fig. 1 and 2 show the respective distributions of the responses from the nurses and physicians with regard to the 5 objectives given.

The item that scored the highest among the physicians was (c) *Assisting communication and teamwork between doctors and nurses.* The distribution of responses from the physicians to this objective was bimodal : 4 physicians chose “not at all,” whereas others chose “to some extent,” “considerably,” or “to a great extent.” The standard deviation (SD) of the response distribution from the physicians was the largest for objective (c). For objective (c), the SD of the response distribution from the physicians was larger than that of the response distribution from the nurses.

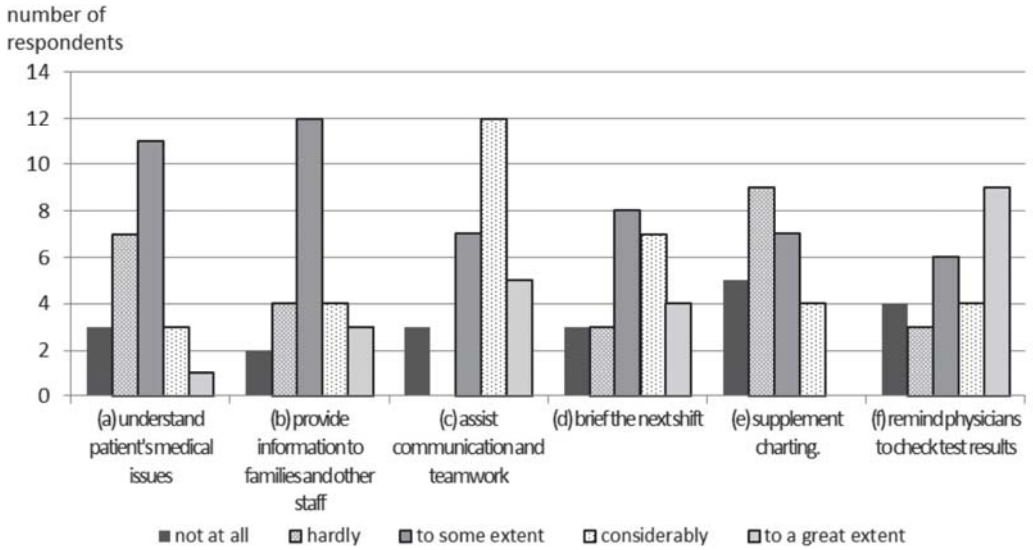

Fig. 3 Effectiveness of SDT for physicians

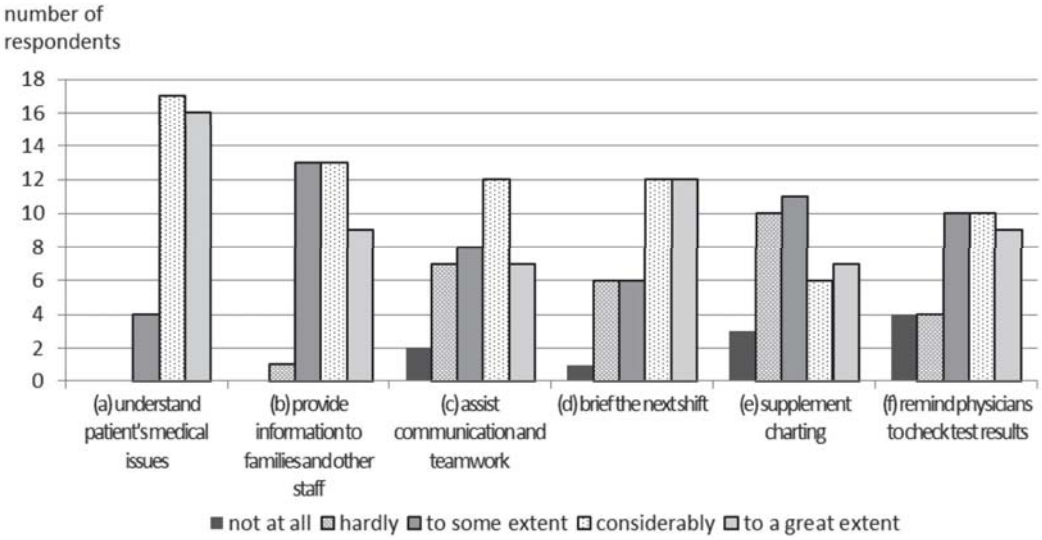

Fig. 4 Effectiveness of SDT for nurses

Q(4) Effectiveness of SDT for each given objective.

Fig. 3 and 4 show the distributions of the responses of the nurses and physicians, respectively, in their assessment of the SDT. The response distributions were fairly similar between both groups with regard to each objective, and were similar in this respective to those observed for Q(3).

There was a consensus among both physicians and nurses that the SDT functions as a reminder to prevent the physicians from forgetting to check study results in a timely manner. The survey revealed that the second-most important role of the SDT according to physicians' estimation was as a reminder, and the SD was the largest for this category.

The relationship between the responses for each objective of SDT use in Q(3) and the measured effectiveness of the SDT for category (f) 'remind physicians to check test results' in Q(4) was analyzed using the Spearman rank-correlation coefficient test. The rank-correlation coefficients were 0.263 for objective (a), 0.178 for (b), 0.486 for (c), 0.339 for (d), and 0.543 for (e).

These results revealed a positive association between all the objectives of the SDT and its role as a reminder. Notably, there was a relatively strong correlation between the estimated effectiveness of the SDT as a reminder and the providers' SDT use for objective (c).

Discussion

The goal of this study was to investigate how the effectiveness of the SDT was perceived by those responsible for its administration. The results revealed differ-

ences in opinion among providers with regard to its utility as a tool for enhancing communication and teamwork. The study also looked at which factors were involved in the SDT's perceived role as a 'reminder'.

Previous studies have reported that poor communication is a major contributory factor in systematic errors in health care, and that assuring adequate communication among medical professionals is essential in enhancing the quality and safety of patient care[1)2)]. This has been observed in ICUs, where verbal communication between nurses and physicians constitutes just 2% of the entire activity but 37% of error reports[3)]. Therefore, strengthening communication among staff members is vital in emergency departments and critical care units.

Some researchers have found that traditional information media such as whiteboards can play a significant role in supporting collaborative work[4)5)]. Others have suggested that surgical safety checklists can reduce mortality and other postoperative complications[6-8)]. However, the exact mechanism of how enhanced patient care is achieved with use of these measures has yet to be fully clarified.

Although the SDT addressed in the present study was not initially designed to serve as a safety tool, its use has provided nursing staff with the incentive to verbally ask doctors about test results, thus adding a safety measure to patient care. The SDT functions in a similar manner to a checklist or whiteboard, by helping physicians to remember to check test results and reminding them of their responsibility to communicate those findings to nurses. Conducting and analyzing a staff survey, as in the present study, has elucidated those factors essential to effective utilization of this new type of safety measure.

The responses to Q(2) underline our concern that it is relatively uncommon for physicians to spontaneously communicate test results to nurses. Interestingly, though, the physicians' estimation of the likelihood of spontaneous communication was higher than that of the nurses. One possible explanation for this discrepancy involves how attentive each group is to such communication taking place. It would appear that some interns do not appreciate the effectiveness of the SDT as they are preoccupied with their own work in a new environment. The responses to Q(1) indicate that physicians may not review test results or communicate them before the nurses ask them for their interpretations.

The results of Q(1) and Q(2) revealed an interesting correlation between objective (c) in Q(3) for purpose of use and that of (f) in Q(4) on the effectiveness of the SDT for each given objective. It appears that physicians who have relatively low interest in inter-provider communication are the ones who have a low appreciation of the effectiveness of the SDT as a reminder. This is one reason the 'reminder' role of the SDT has emerged, and why a double-check system, such as this SDT, should be utilized to prevent communication problems.

Other factors also influence the effectiveness of the SDT. Some interns who rotate in our department are not familiar with the SDT, and have not been instructed to give their interpretation of test results to nursing staff. In other cases, the results of diagnostic workups are not explained to nurses orally, but are written on charts. Frequently, when physicians are very busy, it can be difficult to examine study results in detail, interpret them, or communicate that interpretation to nursing staff efficiently. The SDT has helped enhance more effective communication among all health care providers.

Weiss et al.[9)] found that checklist-based prompting improved multiple processes of care as well as mortality and length of stay compared with a stand-alone checklist. They suggested that the manner in which checklists were implemented may have greater consequences in the care of critically ill patients than in other patients.

In the present study, all the participants' objectives were positively associated with their assessment of the summary as a reminder. Notably, a relatively strong association with the objectives in the areas of communication and teamwork was found. The participants' attitude toward the utilization of the SDT, especially in enabling better communication and teamwork, might be an important aspect in its effectiveness in preventing errors. Interaction among care providers, especially when they are not familiar with a critical care environment, may be essential if such safety measures are to work.

In an outpatient setting, abnormal test results are occasionally lost to follow-up. Abnormalities on chest X-rays, in particular, are often missed by primary care providers. One study found that verbal communication by a radiologist significantly improved timeliness of follow-up[10)]. Some studies have shown computerized clinical reminders to be ineffective if they use "non-interruptive" alert notifications. The present findings concerning the role of the SDT as a reminder are consistent with these earlier results suggesting that measures which enhance verbal interaction and strengthen communication and teamwork among providers can be effective in improving the quality of patient care.

This study has certain limitations. It involved a relatively small number of participants at a single ICU, and this must be taken into consideration in any assessment of the results. Further large-scale studies are needed to confirm these preliminary findings. As previously mentioned, objective measurements such as mortality reduction or shorter hospital stay were not investigated.

Conclusions

The current results demonstrate that utilization of the

SDT by nurses may further improve the quality and safety of patient care as a double check mechanism to prevent errors, whereby nurses can verbally remind physicians to monitor and interpret test results. Although physicians acknowledge the importance of the SDT in facilitating more effective communication and teamwork, some do not proactively communicate test results or remain inattentive to their responsibility to do so. Some human factors remain to be overcome when implementing such safety measures. The use of the present SDT or similar systems would prevent or reduce problems such as treatment delays in a clinical setting in which extremely busy physicians have difficulties in reviewing and communicating test results in a timely manner.

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Conflict of interest statement

All authors declare that they have no conflict of interest associated with this study. No external financial support was provided.

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検査結果サマリーの活用の試みと救急集中治療室における患者のケアと安全性の改善

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【背景】
患者の検査結果はできるだけ早く医療従事者間で共有されることが医療安全上望ましい。しかし、多忙な状況にある救急部や集中治療部においては､すぐに対応できないこともしばしばある。当施設では個々の患者の診断結果(中心静脈カテーテルや気管チューブ挿入後のX線での確認）について申し送り用としてのサマリーが看護師により作成されている。このサマリーの活用に伴い、カルテ未記載、看護師に未伝達の検査結果について看護師が医師に口頭で尋ねるようになった。サマリーが安全策として予期しなかった役割をはたすようになった可能性がある。
【目的】
ダブルチェックシステムとしても作用する検査結果サマリーの効果を確認し、その効果に関わる人的要素を明らかにする。
【手法】
看護師と医師から得られたデータの横断的研究
【結果】
全ての看護師と医師が、サマリーは、医師が結果を確認する有効なリマインダーであると答えた。回答から、医師が検査結果を直ぐに確認して伝えることができていないことが度々あること、サマリー使用に対する医師の姿勢が様々であることが示唆された。リマインダーとしてのサマリーの効果の評価は、従事者の使用目的と正の関連を有し、特にコミュニケーションとチームワークの促進という目的と関連していた。
【結論】
診断的検査結果のサマリーの使用は、スタッフが結果を確認するリマインダーとなり、診療の質や安全性を改善できる。従事者のサマリー使用に対する姿勢、特にコミュニケーションやチームワークを促進しようとする目的はこのシステムの効果と密接に関わっている。

〈キーワード〉コミュニケーション、検査結果サマリー、救急医療、集中治療、医療安全、看護、チームワーク、ダブルチェック