(C-FIND request). The DICOM server then responds by sending the patients' information list to the DICOM-NAS (C-FIND response). The DICOM-NAS extracts information from the responses and sends the related patient's information to the Client's computer. After selecting a particular patient from the list, the Client can obtain the patient's study information list through a data flow similar to the patient's information. The Client can then select a study from the list to obtain the images. The DICOM-NAS generates and sends the request-related query keys to the DICOM server (C-MOVE request). After the DICOM server accepts the request for the patient's images, the images will be copied into the DICOM-NAS, and then sent to the Client's computer. Once all of the images have been sent, they are immediately deleted from the DICOM-NAS.

2.3. *Graphical User Interface (GUI) of the DICOM-NAS*

The GUI of the DICOM-NAS for Query/Retrieve is displayed in Fig. 3. When the DICOM-NAS receives a particular patient's information or all of the information based on a Client's request, the information will be displayed in the patient list space. When the Client clicks on a particular patient's ID or name, the patient's study information will be displayed in the study list space. When the Client clicks on a study date, modality, or study ID, the DICOM images of the study will be displayed on the browser.

The GUI of the DICOM-NAS for the DICOM web viewer is shown in Fig. 4. Since this viewer is an HTML document, it embeds a Java Applet that can perform a dynamic process, which a static HTML document cannot do. The Client can view the images using image-processing functions, such as WL/WW, Zoom, and cine mode.

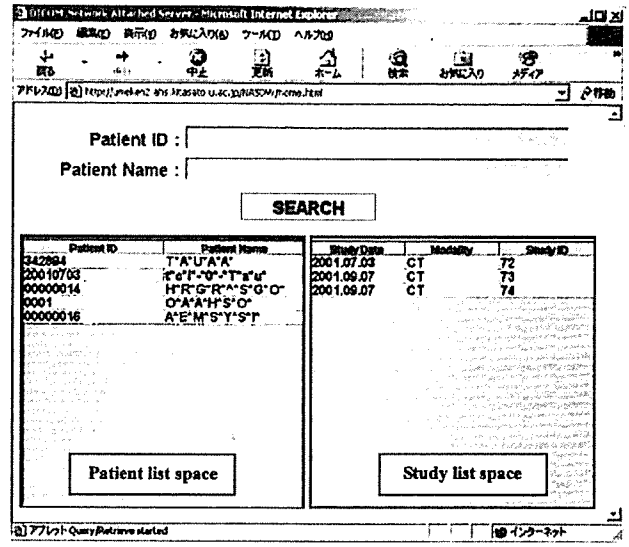

Fig. 3 – GUI of DICOM-NAS (Query/Retrieve).

The DICOM-NAS can be used to manage, create, and view diagnosis reports [15–17]. When the Client clicks the "Report" button on the viewer, the report window will be displayed (Fig. 5). After the necessary input, the diagnosis report will be sent back to the DICOM-NAS. The information will then be stored in the Diagnosis report database. In order to read the diagnosis information stored in the DICOM-NAS, the Client needs to input the URL of the page that contains the information. When the Client accesses the page, the DICOM-NAS will

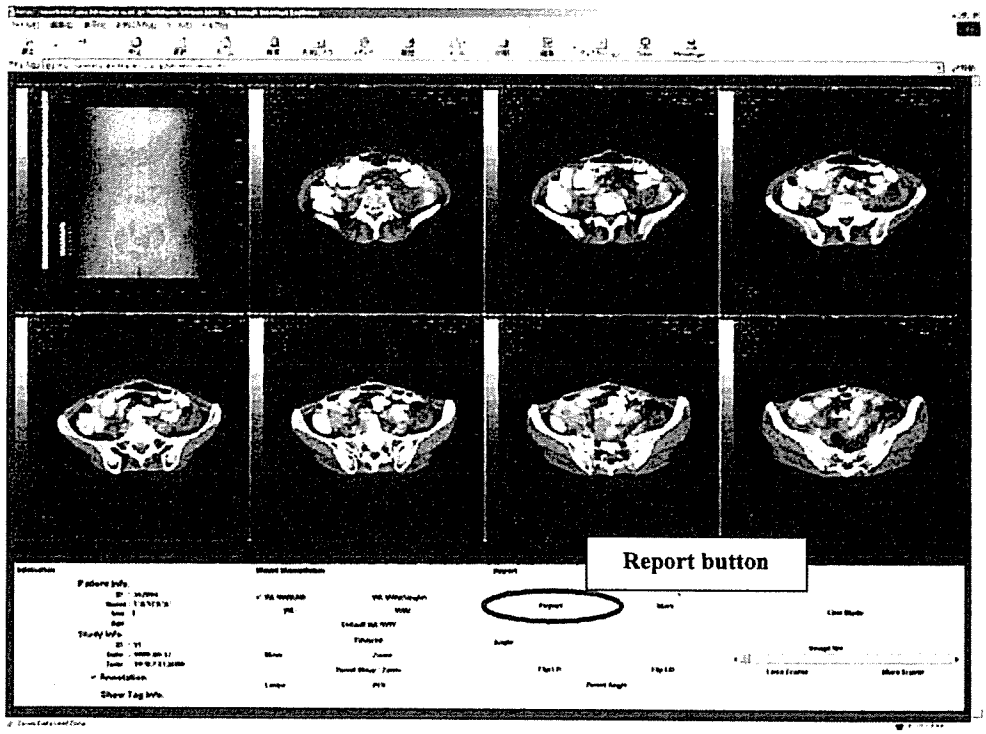

Fig. 4 – GUI of DICOM-NAS (DICOM web viewer).

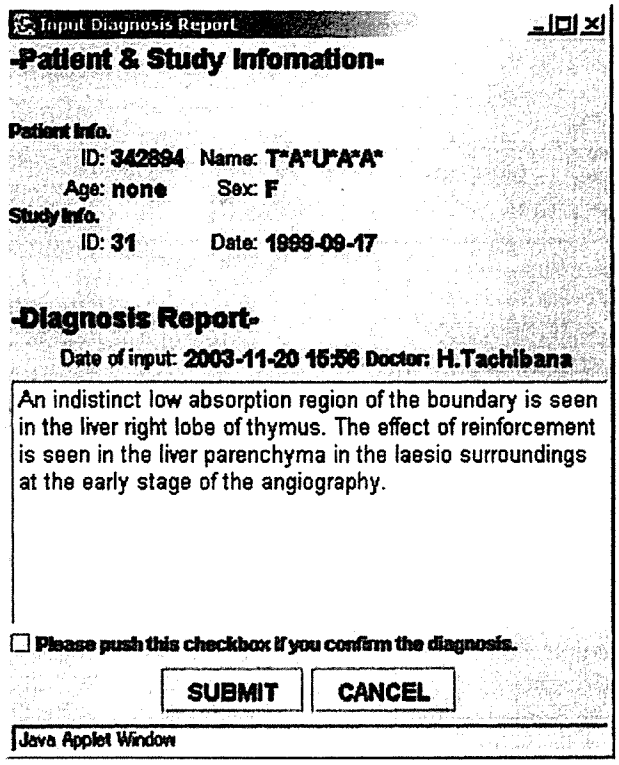

Fig. 5 – Screenshot of a window for inputting diagnosis report.

extract the particular diagnosis information from the Diagnosis report database and transfer it to the Client's computer.

3. Materials and methods

The DICOM-NAS is a PC with a Pentium III 1 GHz CPU having a 512 MB memory and a 60 GB hard disk. The DICOM server has a Pentium II 400 MHz with a 384 MB memory and a 10 GB hard disk. The Client computer has a Pentium IV 2.8 GHz CPU with a 1 GB memory and a 120 GB hard disk. The LAN connections are either a 10 Mbps cable line or 100 Mbps cable line. The INTERNET connection used was the Asymmetric Digital Subscriber Line (ADSL, maximum: 24 Mbps, average: 7.216 Mbps).

In order to evaluate its performance, the DICOM-NAS was connected to two kinds of standard DICOM servers and a Client's computer with LAN and the INTERNET. The DICOM-NAS was able to communicate with both the DICOM servers and the Client's computer. After transferring the images from the DICOM servers to the Client's computer, it will immediately delete all of the images. The downloading time, defined as the time needed for downloading 45 slices (12.8 MB) of CT images (abdomen, 512 × 512, 8 bit, 292 kB/slice) from the DICOM servers to the Client's computer, is measured in four kinds of network configurations (Fig. 6). This time period is 10 times.

4. Result

4.1. *Performance*

The DICOM-NAS was connected to two different DICOM servers, the Image Central Test Node (distributed by Kuratorium OFFIS e.V., University of Oldenburg) and DgS Image server (provided by DgS Computer Co. Ltd.). The Client was connected to the DICOM-NAS through the LAN or the INTERNET. After receiving a request for images from the Client's computer, the DICOM-NAS was able to download the DICOM images from each of the servers, and then sent the images to the Client's computer. When the Image Central Test Node and DgS Image server were both used, the DICOM-NAS was still able to download and transfer the DICOM images. Furthermore, the DICOM-NAS would immediately delete all of the images downloaded from the DICOM servers after the transfer was completed.

4.2. *Measurements*

The time required to download 45 CT image slices from the DICOM servers to the Client was measured in this study. The average and standard deviation of the downloading times are listed in Fig. 7. These images were transferred from the DICOM servers to the DICOM-NAS using DICOM protocol, and were then transferred to the Client using HTTP, excluding the LAN1 that the Client was directly connected to DICOM servers and

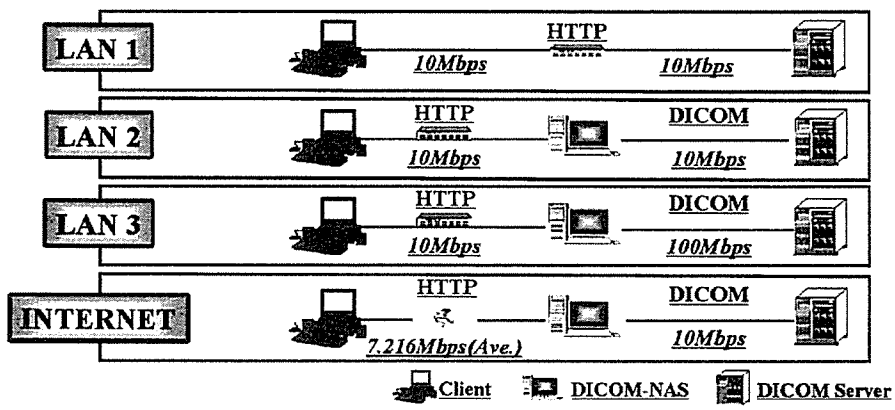

Fig. 6 – Network configurations for measuring the downloading time.

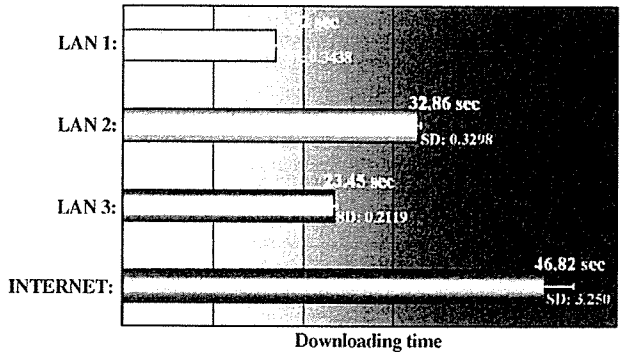

Fig. 7 – Total downloading time on four kinds of network configurations.

was used for downloading the images with HTTP. When the Client was directly connected to the DICOM servers with a 10 Mbps line (LAN1), the downloading time was 16.92 s (S.D.: 0.3438 s). When the Client was connected to the DICOM servers through the DICOM-NAS using cable lines of 10 Mbps (LAN2) or 100 Mbps (LAN3), the downloading times for these images were 32.86 s (S.D.: 0.3298 s) in LAN2 and 23.45 s (S.D.: 0.2119 s) in LAN3, respectively. When the DICOM-NAS was connected to the Client through a 24 Mbps (maximum) ADSL line and connected to the DICOM servers through a 10 Mbps lines (INTERNET), the downloading time was 46.82 s (S.D.: 3.250 s). The standard deviation of the INTERNET was the largest in four network configurations. A comparison of the connecting methods LAN1 and LAN2 revealed that the downloading time increased by 94.2%. However, a comparison between LAN2 and LAN3 revealed that the downloading time decreased by 28.6% when a faster network was used. A comparison between LAN3 and the INTERNET showed that the standard deviation of the INTERNET was larger than that of LAN3, and that the downloading time increased by 42.5% when the INTERNET was used.

5. Discussion

Today, many web-based DICOM servers and viewers can share images from anywhere using Internet Technology and browsers; some of the images are distributed for free. However, many of them only have the function to display the DICOM images and do not have the Query/Retrieve function [3–7]. Others may have both functions, but the Query/Retrieve function depends on particular image databases [8–13]. In general, a patient's original images generated by CTs or MRs in hospitals are stored in DICOM servers. Therefore, extra servers that have large storage devices for image storage must be installed anywhere inside or outside a hospital, and this (using IT, but that) would cost a large amount of money. As an alternative method, a web-based server could be used to store the patients' original images to reduce the installation cost; however, the threatening risks of invading the patient's privacy are higher because an attacker can steal and modify the images via the INTERNET. We therefore designed and developed the DICOM-Network Attached Server to solve the cost and security problems. The DICOM-NAS can communicate with two different DICOM servers, and it enables the Client to obtain medical information and images from the DICOM servers. The DICOM-NAS plays an important bridge role between the DICOM protocol and HTTP and can immediately delete all information and images downloaded from the DICOM server after transferring them to the Client's computer. Since the DICOM-NAS only temporarily stores the requested images, and the DICOM servers keep all of the original DICOM images, unwanted outsiders attempting to access the DICOM-NAS cannot access any patients' medical information.

Fig. 7 illustrates that the downloading time increases when the DICOM-NAS is used. After the Client requests to download the images, all of the images are temporarily stored in the DICOM-NAS. This extra information transfer and temporary downloading time increases the total working time. However, using faster cable lines can reduce this increase. According to our experience, the increased time by DICOM-NAS could be very small when the Fiber To The Home (FTTH), a faster ADSL, or a faster PC is used.

6. Conclusion

The DICOM-NAS developed in the present study has the following features: (a) it plays a bridge role between the DICOM protocol and HTTP. (b) It does not require a large amount of storage and can improve information security to better protect patients' privacy. (c) It can easily install, transfer, and distribute information and images stored in the DICOM servers. When medical images are transferred from the DICOM-NAS to the Client, image confidentiality can be improved on the INTERNET using Virtual Private Network (VPN) technology [18].

The DICOM-NAS program can be downloaded for free from the website http://umeken3.ahs.kitasato-u.ac.jp/, and can be easily installed. In conclusion, the DICOM-NAS is useful because of the above-mentioned advantages, and it does not generate much cost.

Acknowledgements

This study was partially supported by a Grant-in Aid for Exploratory Research, No. 40142319, 2002–2003, and a Grant-in Aid for Scientific Research (A), 15209022, 2003–2005, from the Japan Ministry of Education, Culture, Sports, Science, and Technology.

REFERENCES

[1] Ministry of Health, Labor, and Welfare of Japan, http://wwwl.mhlw.go.jp/toukei-i/isc998/index.html.
[2] T. Umeda, K. Inamura, K. Inamoto, et al., Development and evaluation of oral reporting system for PACS, Comput. Methods Prog. Biol. 43 (1994) 115–123.
[3] T. Osaki, H. Ban, H. Matsuo, et al., A teleradiology system with realtime and e-mail-based operating modes, Med. Imaging Tech. 16 (6) (1998) 615–621.
[4] A. Alaoui, J. Collmann, D. Nguyen, et al., Implementing a secure teleradiology system using the Internet, CARS (2003) 803–808.

[5] N. Yokohama, Construction of DICOM-WWW gateway by open source, and application to PDAs using the high-speed mobile communications network, Jpn. J. Radiol. Technol. 9 (9) (2003) 1155–1163.
[6] J. Bernarding, A. Thiel, A. Grzesik, A JAVA-based DICOM server with integration of clinical findings and DICOM-conform data encryption, Int. J. Med. Inf. 64 (2–3) (2001) 429–438.
[7] P. Cao, M. Hashiba, K. Akazawa, et al., An integrated medical image database and retrieval system using a web application server, Int. J. Med. Inf. 71 (1) (2003) 51–55.
[8] http://mars.elcom.nitech.ac.jp/dicom.
[9] K. Muto, Y. Emoto, K. Anami, et al., Low/no cost DICOM server which is integrated with JAVA viewer and reporting system on a web browser, RSNA 2001 Suppl. Radiol. 221 (2001) 739.
[10] S.P. Laird, J.S.K. Wong, W.J. Schaller, et al., Design and implementation of an Internet-based medical image viewing system, J. Syst. Software 66 (2) (2003) 167–181.
[11] H. Munch, U. Engelmann, A. Schroeter, et al., Web-based distribution of radiological images from PACS to EPR, CARS (2003) 873–879.
[12] G.C. Sakellaropoulos, G.C. Kagadis, C. Karystianos, et al., An experimental environment for the production, exchange and discussion of fused radiology images, for the management of patients with residual brain tumor disease, Med. Inf. 28 (2) (2003) 135–146.
[13] J. Bernarding, A. Thiel, I. Decker, et al., Implementation of a dynamic platform-independent DICOM-server, Comput. Methods Prog. Biol. 65 (1) (2001) 71–78.
[14] Kuratorium OFFIS e.V., University of Oldenburg, http://www.offis.de/indexe.php.
[15] DICOM Supplement 23 Structured Reporting Object, http://medical.nema.org/medical/Dicom/Final/sup23ft.pdf.
[16] K. Inamura, DICOM structured reporting, Med. Imaging Tech. 19 (2) (2002) 101–107.
[17] H.H. Hawkins Jr., Clinical information system for a multi-disciplinary breast center: integration of structured reporting, activity-based costing, and continuous quality improvement, RSNA 2001 Suppl. Radiol. 221 (2001) 741.
[18] H. Tachibana, T. Umeda, Y. Iwata, Secure web-based teleradiology system with integrated structured reporting and VPN technology on a web browser, Med. Imaging Tech. 22 (1) (2004) 26–34.

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SUPPORTIVE CARE: INNOVATIVE APPROACHES TO CARE DELIVERY

A STUDY ON THE FEASIBILITY OF HAVING NURSES EVALUATE PATIENTS FOR CHEMOTHERAPY-INDUCED NEUTROPENIC COMPLICATIONS USING A RISK ASSESSMENT TOOL 306

Kelley Moore, Vice President, Clinical Projects, Supportive Oncology Services, Inc., Barry Fortner, MD, USA

Statement: Chemotherapy-induced neutropenia (CIN) may result in febrile neutropenia and other complications. A risk assessment tool was developed to help evaluate patients' risk for CIN complications, and the feasibility of nurses implementing this tool into clinical practice was also assessed.

Description: Nurses in 15 community oncology practices used the tool to evaluate patients' risk of CIN complications before starting chemotherapy.

Nurses completed an evaluation form each time the tool was used and then a survey assessing the tool's utility.

Findings: The nurses successfully used the tool in all patients, evaluating each for 14 patient risk factors and the chemotherapy risk factor (a regimen associated with a moderate to high risk of neutropenic complications). The most frequently identified risk factors were chemotherapy (55%) and advanced cancer (31%). Nurses reported that the tool helped "identify neutropenia risk" in 69% of patients and "determine the degree or severity of neutropenia risk" in 57%. Nurses reported initiating an action because of the tool in 141 (94%) patients. The actions most frequently reported were "closer monitoring for neutropenia" (64%) and "use of prophylactic G-CSF" (27%). Five (33%) nurses reported that their practices planned to adopt the tool, while 6 (40%) planned to modify it to meet their practices' needs.

Conclusions: Clinical risk assessment tools can quickly and effectively assist oncology nurses in evaluating patients for risk factors of CIN complications. These tools may assist in identifying patients who would benefit from intervention intended to prevent or decrease the severity of CIN complications.

ESTABLISHMENT OF MEDICAL/NURSING SUPPORT NETWORK FOR CANCER PATIENTS AT UNIVERSITIES 307

Tamae Futawatari, Professor, Gunma University School of Health Science, Taro Kano, Yukiko Isobe, Junko Ishida, Kiyoko Kanda, Kazuko Ishida, Japan

Aim: We are working to establish a medical/nursing support network to improve the QOL of local cancer patients. Here we report our university's actual work on the issue in the year of 2005.

Activity details:

1 Gunma Cancer Nursing Research Society

It has held academic meetings patients and their families can participate.

Also, as a training to improve the skills of its members, discussions were made after nurses, pharmacists, and hospital executives gave lectures on "team approach in outpatient chemotherapy" from their side of view.

Comments collected from the participants were generally satisfactory: "The direct voice of the patients touched my heart"; "The opinions of people from other occupations were interesting".

2 Trainings to improve the practical ability of nurses (university's contributive project to the local community).

First, lectures on chemotherapy knowledge and role of nurses were held, and exercises to acquire skills needed in practice were performed. Also, participants were given opportunities to look back on their nursing methods through case examinations. There were comments saying this was a precious opportunity to know the situations of other facilities.

3 Support of cancer patients and their families Cancer nursing consultation was held once a week in cooperation with Gunma University Hospital and dealt with various complicated problems of patients and their families concerning their mental and physical health.

Conclusion: The participants evaluated activities generally satisfactory, and we intend to strengthen the ties of the cancer patients and the nursing professionals.

DEVELOPING TEACHING MATERIALS TO IMPROVE QUALITY OF LIFE FOR PATIENTS WHO HAVE UNDERGONE GASTRECTOMY 308

Hizuru Amijima, Associate Professor, PhD RN, Prefectural University of Hiroshima, Michiyo Yamanaka, MSc RN, Yoshie Sugimoto, PhD RN, Japan

The purpose of this study is to develop and evaluate teaching materials for guidance for living to raise QOL (Quality of Life) for patients who have undergone gastrectomy. To clarify the problems that they had, twenty patients who had undergone gastrectomy, were interviewed after informed consent was obtained. The data were analyzed using Content Analysis.

The data indicated that the patients had four types of problems: physical problems, dietary problems, psychological problems, and support problems.

In more detail the problems, they indicated included: body weight does not increase, anemia, constipation and diarrhea, quantity of meal, meal time is short, anxious about a recurrence, lack of confidence about self-care, lack of support.

These results suggest that important components of guidance for living should include information about post-operative physical problems and how to cope with them, dietary information, points to keep in mind about everyday life, information about medication, and encouragement to have regular health checks.

In order to teach this content effectively, we developed a leaflet, a booklet, and an Internet homepage. We carried out guidance for living for twenty patients who had undergone gastrectomy using the teaching materials which we developed, and conducted a questionnaire survey.

The results of the questionnaire survey showed that the teaching materials we developed were effective, particularly with regard to confidence about self-care and dietary management, and could be used more extensively to provide guidance for living and to raise QOL (Quality of Life).

VISIT NURSING STATION SYSTEM WITH SECURED INTERNET COMMUNICATION USING WATERMARKING TECHNIQUE: TELE-NURSING SYSTEM EXPERIMENTS 309

Tokuo Umeda, Medical Information, School of Allied Health Sciences Kitasato University, Akiko Okawa, Toshiaki Ikeda, Hareaki Yamaoto, Hajime Harauchi, Japan

This paper describes our developed home health care support system. Our system can input vital data automatically.

The tele-nursing system was composing two modules. One is patient house system and the other is the visit nursing station system. The vital data measurement equipment in the patient house was made the blood pressure, the pulse, the blood sugar

SUPPORTIVE CARE: INNOVATIVE APPROACHES TO CARE DELIVERY

value measurement machine, weight, the body fat meter, and a clinical thermometer. Moreover, every day vital data can be transmitted to the visit nursing station by using the network and the telephone line, and the developed systems can be connected with the individual hospitals automatically. Hiding patient information secretly was secured by using the electronic watermark technology when transmitting.

Consequently, the system was able to acquire individual patient's vital data from the vital data measurement equipment automatically. Moreover, it was possible to glance at these vital data and glance at a change with the lapse of time because the chart was made to be displayed automatically. In addition, it was possible to glance at the evaluation of a normal range or an abnormal range the vital data of every day. The cooperation physician can evaluate and examine patient's vital data, and the physician can tell the result to the patient using the developed system.

As a result, the patient is able to consult about patient's health cares with visit nurse and physician while staying at home.

DEVELOPMENT OF THE REMOTE NURSING SUPPORT SYSTEM IN AN OUTPATIENT'S CHEMOTHERAPY 310

Akiko Okawa, Adult Nursing, Nagoya City University School of Nursing, Tokuo Umeda, Kazuko Onishi, Japan

In recent years, the chemotherapy in outpatients are increasing. It is very important to grasp the recuperation-at-home patients' condition. In this study, we develop a remote nursing system for supporting outpatients' chemotherapy in order to gain the Quality of Life (QOL) for the patients and their family.

Our remote nursing support system possesses a digital automated sphygmomanometer, so that it may be transmitted and displayed in our system. Also, out system can record the grade of a recuperation-at-home person's pain. We build automated pain measurement system to carry out the Web input of 13 items of the pain condition scale Symptom Distress Scale (SDS).

Moreover, the recuperation-at-home person side system was considered as the panel touch, and carried out simple of the operation. It is necessary to clarify individuality, such as a side-effect of chemotherapy, so that this system supports a better QOL for a patient and its family. Moreover, we are now planning to expand this system to construction of the cooperation system connecting several hospital and patients' homes.

A part of this research received assistance of the Ministry of Education, Culture, Sports, Science and Technology grants-in-aid for scientific research (No.16791382) in the last year.

MEETING THE NEEDS OF ADOLESCENTS POST AUTOLOGUS STEM CELL TRANSPLANT: A PEDIATRIC CENTRE'S EXPERIENCE 311

Josee St-Denis-Murphy, Registered Nurse, IWK Health Centre, Christa McGuirk, Canada

Where we Were: Our health centre has a small pediatric population who require SCT and therefore are referred to other centers that specialize in SCT. The age, maturity and disease protocol of the recipient is taken into consideration when choosing either an adult (local) versus pediatric (out of province) facility. Adolescents who are 14 to 18yrs are possible candidates for SCT in the local facility. The adult facility identified an absence of specific services required to provide holistic care to adolescents and their families.

Benefit of Change: Recognizing that we can meet the needs of the adolescent. Both centers decided that autologus SCT recipients would be cared for by our pediatric facility day +1 post autologus SCT until engraftment.

How We Did It: Both institutions set up medical criteria that adolescents were required to meet prior to transfer. The pediatric bone marrow transplant coordinator and other disciplines met to develop evidence based guidelines. Staff were educated.

Outcome: We plan to evaluate this change through focus groups that would include the adolescents, families and staff. Health care professionals working in adult or pediatric oncology could gain from our experience.

THE DEVELOPMENT OF A STANDARDIZED APPROACH FOR LYMPHEDEMA MANAGEMENT 312

Christine Ransom, Registered Nurse, BC Cancer Agency – Centre for the Southern Interior, Maureen Ryan, Allison Filewich, Canada

Lymphedema of the upper or lower extremities is a potentially devastating sequel to tumor invasion, surgery and/or radiotherapy. It can occur to varying degrees and at any point in the oncology patient's life span. Nurses at our center have been challenged to provide evidence-based, standardized care for patients at risk or exhibiting signs and symptoms of lymphedema.

There has been recognition that care providers differ in their level of expertise in its management. As well, there is variation in accessibility of services among the many communities within our vast region. This presentation will outline the results of a literature search, a nursing survey and the manner in which an algorithm and resource manual were developed. Future goals for the provision of consistent, seamless care delivery will be discussed.

PSYCHO SEXUAL THERAPY IN CANCER CARE 313

Janet Ellen Jones, Lecturer and Psycho Sexual Therapist, School Of Health Science, University Of Wales, UK

I am running workshops for women with Breast Cancer during their rehabilitation 35–70 years. We are discussing loss of sex drive, clitoral shrinkage, relationship failure since diagnosis and treatment.

My workshop involves coaching the women to get back to being sexual for themselves and their partners. How to talk to their partners, clothes to wear and self-esteem.