

NanoZoomer[®] in action (2)

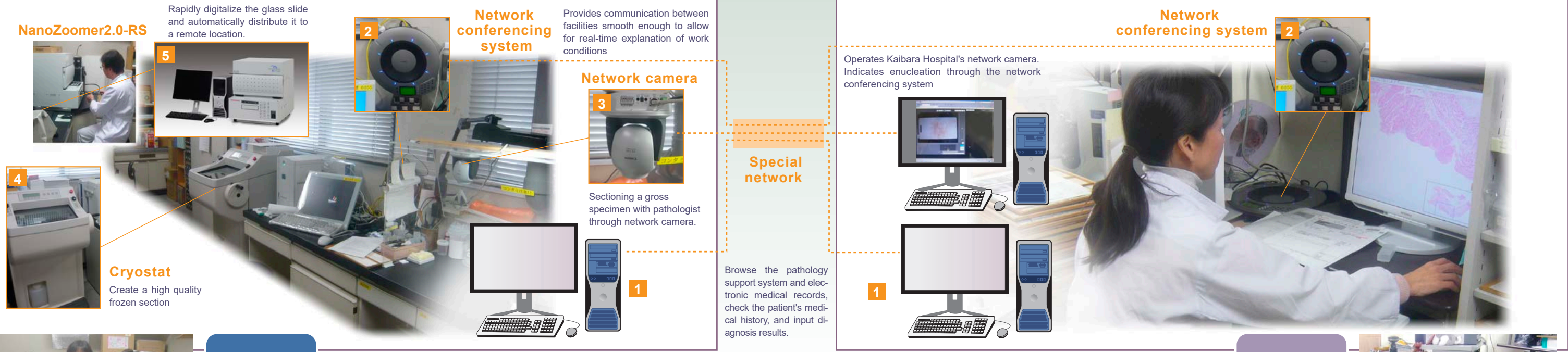
Remote intraoperative diagnosis at Hyogo Cancer Center
and Hyogo Prefectural Kaibara Hospital



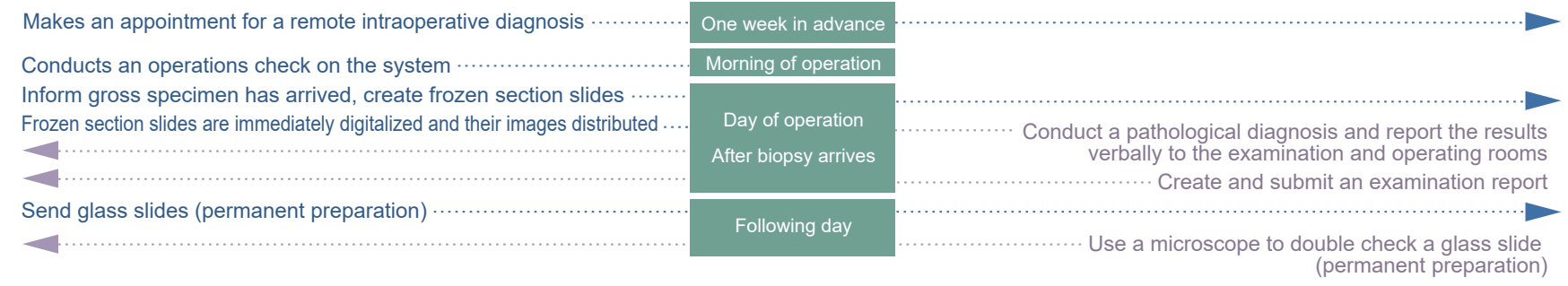
Hyogo Prefectural
Kaibara Hospital

Hyogo Cancer
Center

Remote intraoperative diagnosis system using NanoZoomer at Hyogo Cancer Center and Hyogo Prefectural Kaibara Hospital

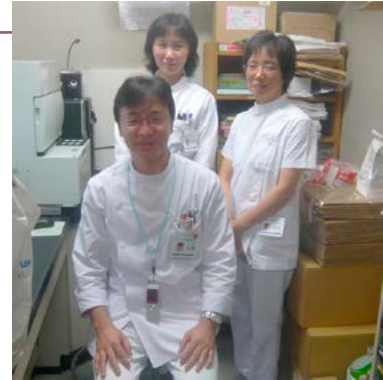


Remote intraoperative diagnosis workflow using whole slide imaging



Hyogo Prefectural Kaibara Hospital

Hyogo Cancer Center



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Dr. Chiho Ohbayashi, Clinical Pathology Department, Hyogo Cancer Center

Interview with Makiro Ishibashi, technician at Hyogo Prefectural Kaibara Hospital

- What sort of operations do you do with NanoZoomer?**
We mostly use it for remote intraoperative tissue diagnosis with Hyogo Cancer Center. We started in April 2010, and create an average of five or six whole slide imaging a month for remote intraoperative tissue diagnosis.
- What are the benefit and drawback?**
The biggest benefit is that operations that could only be performed once a week when the pathologist was present can now be performed daily. It takes about 20 minutes to get results from one section, so our surgeons are extremely satisfied. The drawback is that there is a little more work load for the lab technicians.
- What happens if there is any trouble?**
We would decline any remote intraoperative rapid diagnosis if there was any trouble with the system. We check system operations every morning there is an operation, but we can't predict when there will be trouble. So it's important when operating such a system to clarify policies for what to do if trouble happens.
- What do you hope for in the future?**
It would be nice if whole slide imaging could be applied to intraoperative cytodiagnosis. Right now in terms of time it takes about 20 minutes just to prepare the slides, and five to ten minutes to scan it, depending on the conditions. There are also problems with file image size and diagnosis precision using whole slide imaging, but in the future we will need to clarify the division of responsibility between physicians and technicians for such a system.

- What is necessary in remote intraoperative rapid diagnoses?**
The following set of five points are a must:
 - 1 Special network environment
 - 2 Network conferencing system
 - 3 Network camera
 - 4 Cryostat
 - 5 Whole slide scanner

The purpose of a network environment that can remotely access data is to secure the network, browse pathology support and electronic medical records systems, confirm patient's medical history, and input diagnosis results.

Interview with Dr. Chiho Ohbayashi of the Hyogo Cancer Center

- What sort of operations do you do with NanoZoomer?**
We mostly use it for remote intraoperative diagnosis (receiving side) with Hyogo Prefectural Kaibara Hospital using whole slide imaging.
- Why did you think to use it in this way?**
We had a strong request from the surgeons of Kaibara Hospital. Traditionally, intraoperative diagnoses were conducted by part-time pathologists who were only here on Fridays, but with the increasing number of operations the surgeons made a request to perform operations on other days while keeping the quality of the operations the same. So if we implemented a device that creates whole slide imaging, we could send tissue preparation images to remote locations, thereby creating a system that would allow for remote rapid diagnoses regardless of the day.
- What are the benefits and drawbacks?**
The benefit is quick response on viewing software. Not as quick as with microscope observations, but it allows for a stress-free observation. The drawback is it can be difficult to focus depending on the condition of the frozen section. It seems especially hard to focus on fold frozen specimens.
- What difficulties did you have in realizing this system?**
The most important point is how to create a good frozen section slides for remote intraoperative diagnosis. The skill of the technician and the performance of the cryostat are extremely important in slicing a frozen specimen smoothly. There is a huge difference in preparation between when the pathologist is and isn't nearby to a technician. When the pathologist is nearby, pathologist can give detailed advise on thickness of

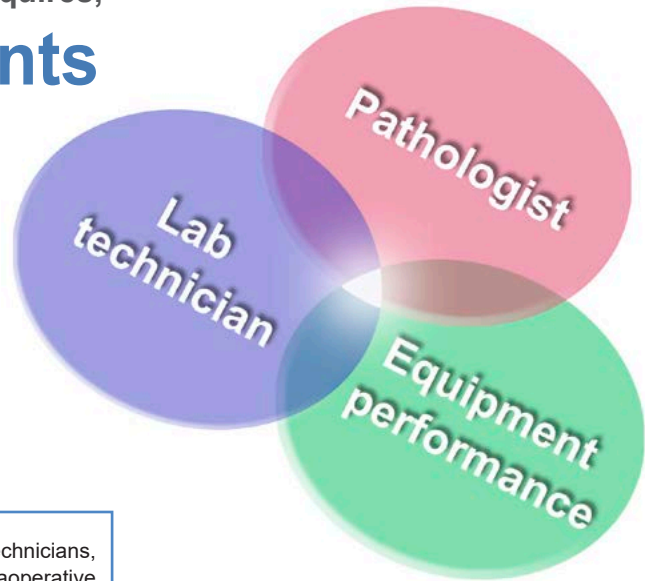
the slice and where to slice for each gross specimen, which helps create high quality slides. We implemented a network conferencing system and network camera when doing remote diagnoses to provide communication as smooth as when the pathologist is nearby. Combined with the network camera, we can give accurate instructions on section. It's of the utmost importance that a human network has been established when conducting remote intraoperative rapid diagnoses. Even once we began remote intraoperative rapid diagnoses, we visited Kaibara Hospital once a week and trained with them so that we would have mutual understanding with their technicians.

- What else is needed to use this elsewhere?**
It's important to clarify operation and operation rules in addition to whole slide scanners and cryostats.

The important points for implementing and operating a remote intraoperative diagnosis system using whole slide imaging

Remote intraoperative diagnosis system requires,

Three important points for collaboration



[Text]

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pathologist at Hyogo Cancer Center

Makiro Ishibashi

laboratory technician at Hyogo

Prefectural Kaibara Hospital

(now the Hyogo Prefectural

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3 main elements that support the system

We feel that collaboration between pathologists, laboratory technicians, and equipment performance is important in providing remote intraoperative diagnoses. A high precision diagnosis is impossible if either the engineering skill of the laboratory technician that creates a good sample, the performance of the equipment that immediately converts that into a whole slide imaging, or easy operability on the pathologist side is lacking.

Hurdles to clear when building a system

- Creation of a good specimen that can withstand diagnoses
- Creation of a high speed whole slide imaging
- Easy, speedy operability (viewer)
- Extraction of gross pathology and lesion position
- Collaboration between pathologist and lab technician
- Security protocols (encrypted communication)

Surprising results

We are satisfied with the following results by implementing the system.

- (1) Time between submitting the biopsy to the pathology diagnosis report (intraoperative rapid examination time)
Ave. 21 mins \pm 4 mins (46 cases) for one specimen. For multiple specimens, ave. 31 mins \pm 6 mins (9 cases)
- (2) Time to create a whole slide imaging (for one specimen)
Ave. 2 mins 27 secs \pm 58 secs (67 sections)

This has allowed the Hyogo Prefectural Kaibara Hospital to provide a safe and reliable operating environment as a central cancer hospital. In light of recent problems with the lack of pathologists and treatment facilities outside of major cities, we feel that the need for this kind of system will continue to grow.

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