IMPLEMENTING A MULTIHEADED MICROSCOPE

A Proposal for the Pathology Lab at Royal Inland Hospital

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Executive summary

This proposal is addressed to Heidi Coleman, the Chief Executive Officer at the Royal Inland Hospital Foundation, representing the Anatomic Pathology Lab at the hospital to suggest the introduction of a nine-headed microscope for use by the physicians to support collaboration when dealing with complex or unique cases.

Currently, without access to a multi-headed microscope, it is difficult for lab workers to collaborate on issues or share necessary information from slides. Individual microscopes must be adjusted each time they are used by a different person or when a new slide is added. Further, it is difficult to pinpoint specific details on a slide when a microscope is only usable by one person. These issues, and others, may cause activity in the lab to slow down. Interior Health, and likewise the Royal Inland Hospital, value striving for continuous improvement and best outcomes. Therefore, a proposed solution must meet the following criteria:

- Future Proof – device must be innovative and upgradeable so it can be used as technology evolves, therefore functioning as a cost-saving measure over a long period of time.
- Adaptable – must be configurable to fit withing the confines of the laboratory space, requiring little changes to infrastructure and, preferably, little additional purchases to be made.
- Easy to implement – introduction of device must not interfere with the operations of the pathology lab.
- Accessible – usage of the microscope must be intuitive, with little opportunity for confusion or disruption. For example, the projected image between heads must be high-quality and each user must be able to configure the additional microscope heads to support their vision needs.
- Collaborative – must support collaboration between pathologists. The observer must be able to direct attention of co-observers to specific elements on a slide and the microscope must support digital imaging for further inspection of cases

The Zeiss Axioscope 5 Multidiscussion Microscope provides opportunity for pathologists to collaborate and share inquiries within the lab. The microscope is customizable to fit within any lab space, therefore requiring little adjustment to the current laboratory space. Each microscope head is fully adjustable and able to project the same image in the same clarity and orientation as the main microscope body. With these features available, the pathology lab will be able to provide clearer, more accurate information through collaborative work. Integrating the Zeiss Multidiscussion microscope at the pathology lab at RIH will reduce time physicians will spend on cases while improving the quality of work done.

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Introduction

This proposal offers a solution to upgrade the infrastructure at the Royal Inland Hospital Pathology lab by introducing a multiheaded microscope to improve collaboration between pathologists. This proposal comes in response to feedback from the pathologists at the lab.

Without access to a multiheaded microscope, the process of setting up a slide and locating the point of interest must be done multiple times [1]. This makes sharing inquiries between pathologists a time-consuming and inefficient process. Collaboration is an imperative when it comes to some of the more difficult cases that pass through the pathology lab. Without a robust system to support collaboration, there is a higher risk of error or misinterpretation of data.

The Royal Inland Hospital Foundation should introduce the Zeiss Axioscope 5 Multidiscussion Microscope to improve the efficiency and standards of care of the pathology lab. With easily accessible options for collaboration and communication, the pathology department could assess cases far easier and with more effectiveness [1]. This would be a major step in improving the efficiency and standards of care at the hospital.

This proposal will first outline the challenges in collaborating faced by the pathologists and Royal Inland Hospital. Then, the proposal will introduce a solution through means of adopting the Zeiss Axioscope 5 Multidiscussion Microscope and explore the potential benefits of adopting the solution. Finally, it will introduce a strategy to adopt the Zeiss Multidiscussion Microscope into the lab.

Issues With Collaborative Work at the Lab

Interior Health centers its goals on improving health and wellness, delivering high quality care, ensuring sustainable health care by improving innovation, productivity, and efficiency, and cultivating an engaged workforce and healthy workplace [2]. Royal Inland Hospital aspires to meet these goals to provide the best care possible. However, the pathology lab at the hospital is experiencing challenges with providing optimal care because of complications surrounding the efficiency of work within the lab.

As it stands, the pathologists in the lab must operate separately on cases. The opportunity for discussion and collaboration is complicated by the lack of infrastructure for supporting group work. To share information with another pathologist, the slide would have to either be taken to another pathologist's station, or the microscope in use would have to be reconfigured to support the new user. In addition, it is difficult for one pathologist to point out the focus of discussion on the slide when working this way, as they'd have to rely on verbal communication to do so. This can cause issues with miscommunication or misinterpretation of the data [1].

A new microscope is a serious investment for the Royal Inland Hospital. Therefore, it is expected to maintain a reasonable budget for the requested microscope. The microscope will have to fulfill the ideal criteria while not requiring excess funds. These limitations in budget also concern the size of the laboratory space. The microscope must be of adequate size so that the laboratory will not need an expansion or renovation to accommodate it.

What is the Ideal Way to Solve This?

To find the optimal solution that meets the needs of the pathologists at Royal Inland Hospital, the following conditions must be considered:

- Future Proof – device must be innovative and upgradeable so it can be used as technology evolves, therefore functioning as a cost-saving measure over a long period of time.
- Adaptable – must be configurable to fit withing the confines of the laboratory space, requiring little changes to infrastructure and, preferably, little additional purchases to be made.
- Easy to implement – introduction of device must not interfere with the operations of the pathology lab.
- Accessible – usage of the microscope must be intuitive, with little opportunity for confusion or disruption. For example, the projected image between heads must be high-quality and each user must be able to configure the additional microscope heads to support their vision needs.
- Collaborative – must support collaboration between pathologists. The observer must be able to direct attention of co-observers to specific elements on a slide and the microscope must support digital imaging for further inspection of cases

The Solution: A Multi-Headed Microscope

The Pathology Lab at Royal Inland Hospital should introduce the Zeiss Axioscope 5 Multidiscussion Microscope to solve the issues with collaboration and case study analysis.

What is the Zeiss Multidiscussion Microscope?

The Zeiss Multidiscussion Microscope is designed to have more than one individual observe a slide concurrently to analyze specific cases. With multiple configurations available, the Zeiss microscope can include up to 20 additional viewers and four different microscopes to choose from. It is designed for the optimal collaborative viewing experience, all the while maintaining accessibility and simplicity.

The proposed base microscope for the Zeiss Multidiscussion is the Axioscope 5. As opposed to the other three, the Axioscope 5 has a greater number of LEDs, a higher minimum viewing height, and a greater number of available additional heads [3].

Accounting for the space available in the lab, as well as the number of pathologists typically employed there, it would be optimal to acquire a nine-headed microscope. Since the shape of the microscope is configurable, the Zeiss Multidiscussion Microscope can be adjusted to fit into the laboratory space at Royal Inland Hospital. Each tube on the microscope has its own adjustable support legs, meaning that there is no need for any additional equipment to set up the microscope, for it can stand on the average table (Figure 1).

Figure 1: 3-headed Model of the Zeiss Multidiscussion Microscope.

The Zeiss Multidiscussion Microscope includes tools to support the main observer presenting information to the co-observers. The fibre-optic cables and separate, adjustable eyepieces allow for precise and accurate viewing from each user of the microscope. To promote collaboration in all manner of situations, the Zeiss Multdiscussion Microscope includes features such as a colour pointer used by the main observer to instruct and inform the co-observers (See Figure 2).

Figure 2 Example of the colour pointer on the Zeiss Microscope in white, red, and green.

To facilitate collaboration between hospitals, the Zeiss Multidiscussion Microscope comes equipped with built-in connections for a digital camera and computer. This allows for high-quality imaging to be done and shared when needed.

Cost of the Zeiss Multidiscussion Microscope

The pathology lab currently has access to the additional infrastructure to construct and implement the Microscope, including a digital camera, computer, and workspace, therefore there are no additional costs on top of the microscope itself. The table below breaks down the estimated cost of the Zeiss microscope.

Table 1: Cost breakdown of the Zeiss Multidiscussion Microscope

Device	Cost
Zeiss Axioscope 5	$17,500
Multidiscussion, 8 additional heads	$18,500
Total	$36,000

Implementation

Space within the lab will have to be allocated for the introduction of the microscope. Because the microscope can stand on its own, the lab will not require the construction of additional infrastructure to support it, instead using one of the tables currently present within the space. Otherwise, the implementation of the microscope will require minimal resources.

Activities within the lab will not be significantly impacted, for the implementation will only take two to three days. Approximately one day would be needed to assemble the microscope and additional heads. On the next day, the optics and lighting would be adjusted. The orientation of the microscope within the lab would appear as follows (See Figure 3):

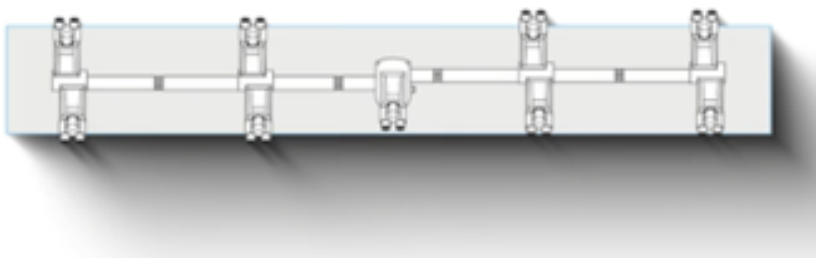

Figure 3 Proposed orientation of the Multiheaded Microscope in the laboratory space.

Evaluation of the Implementation of the Microscope

To meet the criteria of the optimal solution outlined at the beginning of this paper, the conditions of the pathology lab at Royal Inland Hospital must improve with the introduction of the Zeiss Multidiscussion Microscope.

Meeting the Criteria

The Zeiss Multidiscussion Microscope comes with a variety of features that would improve the quality of work at the pathology lab at Royal Inland Hospital.

Future Proof

The Zeiss Multidiscussion Microscope is expandable and new microscope modules can be added. As technology advances, the microscope can evolve as well, making it future proof. The base microscope, as it is when initially purchased, includes many features to promote energy efficiency, cost-effectiveness, and a longer lifespan. It is built to be stable, meaning that it will be resistant to warping or bending under the weight of the body. In addition, the microscope includes LED illumination, giving the microscope low energy consumption and a longer lifetime.

Adaptable

Because of its flexible configuration and adjustable supports, the microscope can be built to adapt to the needs of the space it will occupy. With individual supports for each tube, it is stable, will not warp, and is able to be placed on an average table. The ball and socket joints on the microscope will also ensure that the device does not tip in the case of an uneven structure.

Easy to implement

Without the need for additional infrastructure to be built within the lab, the Zeiss Multidiscussion Microscope will not disrupt daily operations. Further, the implementation of the microscope will require little time and no additional training.

Accessible

Each lens of the Zeiss Multidiscussion Microscope is stand-alone in terms of use. This makes the microscope accessible, because the main observer and each co-observer can adjust the lenses to their own vision needs. Further, the adjustable height and angle of the headpieces allow for comfort for those at the microscope for long periods of time, therefore maintaining a safe working environment.

Collaborative

The Zeiss Multidiscussion Microscope Includes a moveable light pointer that can appear in white, green, or red. This tool is built in to support collaboration. The main microscope user can direct attention to specific locations on the projected slide without worrying about the colour of the slide stain blending in with the pointer. The microscope also Includes a built-in camera port, four multichannel fluorescence channels, and automatic image adjustments. With this included, the microscope can produce crisp and accurate digital imaging to provide options for further analysis of the slide, whether it be individual or collaborative analysis. The attached camera system also allows for the pathologists to consult with others over long distances, allowing for better communication when dealing with complex cases that may concern multiple hospitals.

Limitations of the Zeiss Multidiscussion Microscope

Despite the ability to add additional heads to the microscope, expansion may prove to be difficult in the case of an increase in staff. An increase beyond the microscope limit of 20 additional heads is unlikely. However, a smaller increase of, say, 10 or 12 heads would require significant modifications to the laboratory space. This issue could be somewhat alleviated by using a video camera and monitor with high-definition capabilities.

Conclusions and Recommendations

This proposal recommends that the Royal Inland Hospital Foundation approves the purchase of the Zeiss Multidiscussion Microscope for the pathology lab. The Zeiss Multidiscussion Microscope is a multi-headed microscope built to encourage collaboration between users.

Although the purchase of the microscope has a steep initial cost, the quality and output of work done by the pathology lab will significantly increase upon implementation. The introduction of the microscope to Royal Inland Hospital will not only improve the communication between pathologists in the lab, but also with workers in neighbouring hospitals due to the increased accessibility.

Introducing the microscope to the lab will require little time and little adjustment to the lab infrastructure. The Zeiss Multidiscussion Microscope has proven to meet the criteria of an ideal solution.

Appendix: Interior Health Strategic Direction

Vision

Health and well-being for all.

Mission

Working together to improve quality of life for individuals and communities, inspired by innovation and partnership.

Our values

- **Quality** – We strive for continuous improvement and best outcomes
- **Integrity** – We are accountable for our actions and words, guided by honesty and trust
- **Compassion** – We seek to understand, to listen, and to show kindness, as we treat each other and all people with respect
- **Safety** – We are committed to providing care and services that are safe, and to ensuring people feel culturally, socially, emotionally, spiritually and physically safe

Goals

- Improve health and wellness
- Deliver high quality care
- Ensure sustainable health care by improving innovation, productivity, and efficiency
- Cultivate an engaged workforce and healthy workplace

References

[1] S. Wilkinson, “Multi-head training microscopes - what are they used for?” *Microscopes.com.au*, Jan. 05, 2024. https://microscopes.com.au/blogs/news/multi-head-microscopes-collaborative-learning-made-easy (accessed Dec. 09, 2024).

[2] “Our Story | Interior Health,” *Interior Health*, 2023. https://www.interiorhealth.ca/about-ih/our-story#ministry-of-health-direction (accessed Dec. 09, 2024).

[3] ZEISS Microscopy, “ZEISS Axioscope 5 - 10 Highlights in 90 Seconds,” *YouTube*, Mar. 08, 2021. https://www.youtube.com/watch?v=Itg0TxBrqcY (accessed Dec. 09, 2024).

Interviews: Most of the information in this document was collected through telephone interviews with Dr. Bruce McNeely.

Interviews done on October 27th and November 19th.