

The role of gross and microscopic descriptions in pathology reports

by

Madeline Bernuetz

A Practicum submitted to the Faculty of Graduate Studies of

The University of Manitoba

in partial fulfillment of the requirements of the degree of

MASTER OF SCIENCE

Department of Pathology

University of Manitoba

Winnipeg

Copyright © 2021 by Madeline Bernuetz

ABSTRACT

Background: The implementation of mandatory synoptic templates in the final diagnosis section of pathology reports has been associated with increased uniformity and clarity though the content and format of other pathology report sections have yet to be examined. This study appears to be the first of its kind to examine the importance of gross and microscopic descriptions for pathologists and clinicians.

Methods: Survey invitations were forwarded to both pathologists and clinicians on their use and their perceived value of the gross and microscopic description sections. A retrospective review of pathology reports of the specimens most commonly submitted to pathology was then performed to determine the elements currently included in/ omitted from microscopic descriptions.

Results: Overall, the majority of pathologists indicated they at least usually read the gross descriptions of biopsies (73.59%) and excisional specimens (91.18%) but rarely felt that microscopic descriptions should be included for biopsies (81.25%) nor excisional specimens (78.13%). Pathologists also indicated they believed gross and microscopic descriptions were rarely read (72.73% and 57.58% respectively), understood (54.55% and 42.42% respectively), or utilized by clinicians. However, the majority of clinicians indicated that they always read pathology reports (94.94%) and at least usually read and understood the gross (79.66% and 85.80% respectively) and microscopic descriptions (91.23% and 87.06% respectively) and found these sections valuable. The pathology report review revealed that microscopic descriptions were included most frequently for renal (100%) and hepatic (45%) biopsies and dermatological excisions (53.85%) and consisted of histological descriptions and ancillary studies of the respective tissues. Other specimen types including pulmonary, and breast biopsies along with gynecological excisions included this information in the comments section.

Conclusion: In summary, pathologists are advised to be cognizant that clinicians read and find value in the gross and microscopic description sections. Furthermore, there appears to be a discordance between where elements are included in pathology reports depending on specimen type. For increased consistency and clarity, it is recommended that elements be included in designated sections across all specimen types.

ACKNOWLEDGEMENTS

I would like to start by thanking Dr. Gabor Fischer for suggesting this thesis topic and for allowing me to work on this project alongside him as well as my committee members Dr. Francis Shih and Dr. Shantanu Banerji for their guidance and assistance. Jacqueline Bowes, Dr. AbdulRazaq Sokoro, and everyone else who assisted with the distribution of the survey invitations. Additionally, I would like to thank Lance Fuczek, Dr. Robert Wightman, Terri Martin, and Terri Braverman for their roles assisting me throughout the Pathologists' Assistant program. Finally, I would like to thank my family Gray, Tara, and Oscar for their never-ending support and company throughout the writing process.

TABLE OF CONTENTS

| | |
|---|-----|
| Abstract | II |
| Acknowledgements | III |
| Table of Contents | IV |
| Introduction | 1 |
| The Role of Pathology Reports | 1 |
| The Format of Pathology Reports | 2 |
| Misinterpretation of Pathology Reports | 4 |
| Implementation of Synoptic Templates | 6 |
| The Content of Gross Descriptions | 8 |
| The Content of Microscopic Descriptions | 10 |
| Literature Review | 11 |
| Objective of Thesis | 15 |
| Materials and Methods | 17 |
| Part I | 17 |
| Part II | 18 |
| Part III | 19 |
| Results | 20 |
| Part I | 20 |
| Part II | 27 |
| Part III | 35 |
| Discussion | 42 |

| | |
|---|-------|
| The Value of Gross Descriptions | 42 |
| The Value of Microscopic Descriptions | 45 |
| The Current Content of Microscopic Descriptions | 47 |
| Limitations | 55 |
| Conclusions | 56 |
| References | 58 |
| Appendix A | i |
| Appendix A Graphs | i |
| Questionnaire for Pathologists on Gross Descriptions in Pathology Reports | iv |
| Questionnaire for Pathologists on Microscopic Descriptions in Pathology Reports | viii |
| Appendix B | xii |
| Appendix B Table | xii |
| Appendix B Graphs | xv |
| Questionnaire for Clinicians on Pathology Reports | xvii |
| Appendix C | xxii |
| Appendix C Graphs | xxiii |

INTRODUCTION

THE ROLE OF PATHOLOGY REPORTS

The culmination of information extracted from a specimen submitted to the pathology department; the importance of final pathology reports cannot be overstated. Serving as a permanent record conveying clear, complete, and relevant information, it is the main instrument pathologists use to communicate.¹ For other pathologists, previous reports may provide a more detailed patient history than clinical information alone and during consultations can provide additional diagnostic insight.¹ Pathology reports are also increasingly being requested by patients seeking to assemble as much information as possible about their diagnosis.^{2,3} Additionally, they may be reviewed by other individuals such as cancer registrars for research and/or database building purposes.⁴ Nonetheless, pathology reports are most frequently examined by clinicians where they serve as critical tools, providing essential diagnostic, prognostic, and therapeutic information.⁵

Unfortunately, similar to other written medical documents, pathology reports have the potential to be misconstrued by the receiving clinicians, risking potentially adverse ramifications for the patients.^{1,6,7} Though problems with communication may not play as large a role in medical errors as once thought,⁸ any medical error resulting in or with the potential to result in an adverse clinical impact warrants being investigated. Pathology reports are not exempt from this scrutiny. In 2000, Powsner et al. concluded that the crude discrepancy rate was up to 30% between pathologists' intended meaning and surgeons' interpretation,⁶ prompting much research over the subsequent 20 years on the efficiency and comprehensibility of pathology reports.⁹⁻¹¹ Despite the formulation of practical suggestions and new regulations over this same period, there

is still much work to be done to optimize the composition of these reports and enhance pathologist-clinician communication.¹²⁻¹⁴

THE FORMAT OF PATHOLOGY REPORTS

Final pathology reports are generally made up of four sections: the gross description, the final diagnosis, the microscopic description, and comments. Once a specimen is received in pathology, it undergoes vigorous evaluation and processing culminating in the written pathology report. After being accessioned and fixed in formalin as required, specimens undergo macroscopic examination, dissection, and tissue selection during which the gross description section of the pathology report is generated, a process known as grossing.⁵ In Manitoba, this process is almost exclusively performed by medical laboratory assistants, pathologists' assistants, and residents, with the occasional guidance from the pathologist during complicated cases. The resulting gross description typically consists of an overall description of the specimen including all tissues/ anatomic structures present, relevant measurements, and identifiable pathologic processes as well as a guide to any applied orientation inks and a description of which tissue sections were submitted for histologic evaluation by the pathologist.⁵

After being selected, tissue sections undergo an automatic processing step consisting of dehydration, clearing, and infiltration.⁵ Histotechnologists then embed the tissue in paraffin blocks, cut a section of tissue from the surface of the block with a microtome, and place the tissue on a slide where it is dried, stained and covered creating glass slides which are available to be analyzed microscopically.⁵ Pathologists then review the slides and if necessary, consult with another pathologist and/or order any additional recuts, levels or ancillary studies. Recuts refers to the generation of a slide which is the next sequential cut of the tissue from the paraffin block and

may be ordered by the pathologist if they require duplicates of the original slides.¹¹ Levels, also known as deepers, refer to the generation of a slide from a deeper portion of the tissue which may be ordered by the pathologist to appreciate the different relationships of structures present throughout the tissue block.¹¹ Ancillary studies refer to additional tests such as immunohistochemical or molecular tests which provide additional prognostic and therapeutic information to pathologists.¹¹ Finally, pathologists are responsible for dictating the final diagnosis, microscopic description, and comments section of the pathology report and, if required, revising the gross description section to correspond to their findings.

The goal of the final diagnosis section of the pathology report is to list any pathologic processes present in the submitted tissues.^{5, 15} A variety of other additional elements/clarifications may also be included in this section such as references to relevant information from the gross description section, the results of any diagnostic studies performed and an explanation of any discrepancies which may exist between the final diagnosis and frozen section analysis performed during operating room consultations.⁵ Traditionally, the microscopic description section of the pathology report consists of a histologic description of the cytologic features and architecture of the sectioned tissue, however, it may also contain the results of any diagnostic immunohistological stains applied or it may be excluded from the report altogether.¹⁵ Finally, the comments section of the pathology report may incorporate any additional pertinent information not included in the remaining sections for instance the outcome of any requested consultations or ancillary tests, references to previous relevant pathology reports, and recommendations for the clinician or may also be omitted from the report.^{14, 15} Once the pathologist writes or chooses to omit the remaining sections of the report, the final pathology report is assembled and signed out by the pathologist. A copy of the report is then sent to the requesting clinicians who are then able

to use the included information to guide adjuvant treatment and provide prognostic information to the patient.

MISINTERPRETATION OF PATHOLOGY REPORTS

As previously mentioned, the publishing of Powsner et al.'s⁶ influential article "Clinicians Are From Mars and Pathologists Are From Venus" has led to increased scrutiny regarding clinicians' ability to accurately comprehend pathology reports. They provided 34 general surgical attending physicians and trainees sample pathology reports and questionnaires and discovered there was a crude discrepancy rate of 30% between pathologists' intended meanings and interpretation by surgeons.⁶ Though more experienced surgeons had a lower discrepancy rate, it was not significant suggesting that miscommunication in these reports may not be solely attributable to inexperience.⁶ Similar misinterpretation rates of pathology reports (39%) have been recently reported in medical students.¹⁶ Even 39% of specialists, whose increased knowledge on the subject might lead one to presume they're exempt from this type of misunderstanding, have disclosed not always understanding pathology reports,¹¹ suggesting a more widespread and enduring communication issue. Though the rate of these misunderstandings may seem high, the incidence and severity of clinical consequences due to pathology report misunderstandings does not appear to have been investigated. This may be surprising as Powsner et al. reported that important findings such as acute kidney rejection, carcinoma in situ, and presence of deeply invasive bladder cancer were amongst the elements misunderstood in their sample reports.⁶ However, it is possible any potential clinical consequence in real practice may be mitigated by clinicians following up and clarifying with pathologists, as necessary.^{6, 10-11} However, for this to occur clinicians need to be cognizant of

their limitations on interpreting pathology reports and as of yet clinician certainty has not been unequivocally correlated with accurate report interpretations.^{6,16}

Reasons behind this high rate of miscommunication have been attributed both to the specific content of the reports as well as the format.^{6,10,17} As for content, pathologists have been accused of weighing down the final diagnosis section of pathology reports with superfluous information, obscuring the pertinent information from clinicians.¹⁷ As developments in medical research are expanding our knowledge on disease processes, an overabundance of pathological information has resulted in the generation of a myriad of definitions, classifications, and subcategories of pathological disease.¹⁷ If clinical relevance has yet to be widely established for these parameters, i.e. they do not provide information regarding prognosis or guiding adjuvant treatment, clinicians may be unfamiliar with the associated jargon, and using this jargon in final diagnoses results in the possibility for it to be misinterpreted or to overshadow clinically relevant information.^{12,17} When surveyed, family physicians have identified extraneous information, lengthy texts, and unnecessary jargon were the areas in pathology reports which required the most significant improvements.¹⁸

Pathological conventions and phrases open to interpretation may also hinder pathologist and clinician communication in reports.^{6,10,11} Generally pathology residents do not receive any formal training on communication and usually gain their communication skills from observing attending pathologists.¹⁹ This tends to result in conventions that may be familiar amongst pathologists but not clinicians. For example, pathologists generally only report the presence of tissues and pathological processes in a specimen and may not comment on the absence of tissues and/or pathological processes, a convention that clinicians do not share.⁶ Additionally, certain commonly used phrases in pathology, for instance, those which communicate a degree of

certainty such as we favor, the features are consistent with, etc. have yet to be standardized and clinicians have reported widely varying interpretations.^{10,11} Though pathologists have also reported expressing high variability in their interpretation of the significance of these commonly used phrases when surveyed they judged the majority of other pathology reports to be markedly clear suggesting that there may be a larger communication gap between pathologists and clinicians as opposed to between different pathologists.^{10, 11 20}

IMPLEMENTATION OF SYNOPTIC TEMPLATES

Even more focus has been directed on issues with the format of the final diagnosis section of the pathology report which has predominantly been attempted to be rectified by increasing uniformity.^{7,12} Despite early suggestions to standardize the format of this section within institutions to increase comprehensibility, initial forays into standardized reports resulted in larger disparities in clinician comprehension.^{6,15,21} This was particularly true for more experienced clinicians, possibly due to their familiarity with the older report model.⁶ However, it was suggested that after a brief adjustment period along with education and information regarding the report format, overall comprehension would increase as standardized reports would require less clinician interpretation.^{6,17} In 2004, with the impetus of increased comprehensibility and standardization amongst institutions, the College of American Pathologists (CAP) and American College of Surgeons (ACS) established all essential data elements from their cancer reporting protocols as mandatory in the final diagnosis section of ACS Commission on Cancer accredited laboratory pathology reports.²² Many North American Institutions followed suit with the Canadian Partnership Against Cancer (CPAC) and Canadian surgeons beginning to implement synoptic reporting in pathology reports in 2007.²³ Currently, for laboratories in Manitoba to maintain their accreditation, the final diagnosis section must adhere to the

appropriate CAP-based synoptic template. These templates have been established for commonly occurring malignancies in a variety of organs and tissues and are designed to include all the necessary data elements required for patient care presented in a manner that is complete, accurate, and easy to fill out.²⁴ This serves to allow clinicians, researchers, and cancer registrars to extract data quicker and more accurately.²⁴ Synoptic templates are not currently required for benign specimens, malignancies with no TNM Classification of Malignant Tumour staging system, specimens with no residual malignancy after neoadjuvant treatment, and specimens with rare malignancies.²⁴ For now, the final diagnosis section of pathology reports for these specimens is written in a narrative style consisting of paragraphs and full sentences with the pathologist deciding which information to include.

Implementation of compulsory synoptic reporting in final diagnosis sections of pathology reports has been widely regarded as a success and numerous studies have shown its advantages over the traditional narrative style reports. Reports written using a synoptic narrative are more complete, i.e. include all mandatory pathology parameters required by CAP for clinical decision making.^{9,25-27} Additionally, after an initial adjustment period, synoptic report style has been found to increase the clarity and efficiency of communication between pathologists and clinicians as they are quicker to dictate and decipher reducing the risk of misinterpretations.^{9,27,28} Overall, high levels of clinician satisfaction have been associated with synoptic style final diagnosis sections.^{29,30} One downside, however, is that due to the volume of information contained within as well as the formatting, using synoptic style templates may yield much longer pathology reports when compared to their narrative counterparts. This may be of particular detriment to the reviewing clinician who, in today's fast-paced health care system, may be increasingly pressured to optimize productivity.

THE CONTENT OF GROSS DESCRIPTIONS

Despite the plethora of research identifying and rectifying issues with the final diagnosis section of pathology reports, little investigation has been done into the remaining sections of the report. Few studies have reported on the issues with gross descriptions and their potential solutions and few if any studies have reported on these factors in microscopic descriptions.^{6,11,13} Though the importance of the gross description section in pathology reports has been widely emphasized, its content and format have yet to undergo the same level of scrutiny as the final diagnosis section.^{5, 13, 31} Traditionally, pathology residents and pathologists' assistants in training learn how to gross specimens including the dictation of the gross description section through an apprenticeship model by observing more experienced residents, pathologists' assistants, and pathologists.^{13,19,31} However, as dictation styles, communication skills, vocabulary, and descriptive prowess may all vary amongst the teaching individuals, trainees may develop suboptimal and/or inconsistent dictation skills.^{13,19,31} Though textbooks, online resources, and institutional grossing manuals may be provided to the grossing individual, these sources may provide conflicting information between and even within institutions, with many resources incomplete when compared to the large diversity of specimens received.^{5,31} The only report available on the thoroughness of gross descriptions revealed a wide variety in the quality of gross descriptions, with the inclusion of the institution's assigned mandatory gross descriptors varying from 23.1% to 93.6%.³¹ Though only the quality of gross dictations for one institution's residents were examined, more variability in the quality of gross descriptions likely exists amongst institutions particularly for those with different grossing protocols.³¹ Variability also likely exists between different groups including pathologists' assistants and grossing medical laboratory technicians. Furthermore, though this report concluded that the residents' thoroughness of gross

description increased over time, the limited timeline of this study prevented recognition of any long-term individual variability in thoroughness which may potentially be an area of concern in veteran grossers.³¹

Despite these potential inconsistencies the gross description section of pathology reports has yet to be effectively standardized across institutions by any accrediting body. Though certain CAP protocol templates do require elements that may only be evaluated grossly such as the completeness of mesorectal excisions.²⁴ Perhaps the most renowned paper suggesting remedies to known issues with traditional gross descriptions is Raymond's paragraph system which simplifies and standardizes the gross description by dividing it into 5 paragraphs: Specimen Elements, Primary Pathology, Secondary Pathology, Inking Code, and Section Code.¹³ Other general suggestions for the final diagnosis section may also be applied to the gross description such as formatting elements including maintenance of layout continuity, optimization of information density, and reduction of extraneous information as well as expanded communication proficiency.^{1,13,19} It has even been suggested that due to the inconsistent nature of gross descriptions they may one day be replaced by a high-resolution digital image capture system.³² For the moment, however, members of pathology departments in Canada appear to rely on images primarily as an educational tool in complex/ interesting cases and for medico-legal documentation as opposed to a replacement for the gross description.³³ Perhaps the most productive step towards standardization is the transition in individual institutions to using synoptic-style templates for the gross descriptions of certain specimens. Though it would follow that these templates would be valuable for the same reasons they are in final diagnosis sections, there does not appear to be any research on the improvements synoptic templates have for the

gross description section, nor the preference of those writing/ reading the reports. As of yet, no accrediting body has mandatory interinstitutional gross description parameters/ templates.

THE CONTENT OF MICROSCOPIC DESCRIPTIONS

There is even less information available on the inconsistency of the microscopic description sections of pathology reports. This is despite the possibility of even higher variability than in the gross description section, as, unlike the gross description section, it is not always included.¹⁵ Early recommendations for this section state that it need not be included in every report, or if it is included may be combined with or omitted and interchanged with the comments section.¹⁵ Beyond that, the content of this section may be variable. Though traditionally it consists of a histological description of the specimen, it may include a variety of other factors such as the application of special stains, the results of these stains, and any antibodies tested for.¹⁴ However, since this information may also be included in the comments section by certain pathologists, clinicians may find it challenging to search through multiple sections of the report to find specific information particularly if it varies with each report they review.¹⁵ This issue may be exacerbated by microscopic descriptions laden with extraneous and specialized information.¹⁷ As the histology terminology commonly included in this section is likely the pathology jargon furthest removed from clinicians' daily discourse, this language may be somewhat unfamiliar and baffling to clinicians.⁶ As sections of pathology reports requiring interpretation tend to be the most often misconstrued, the use of this jargon risks miscommunication between pathologist and clinician.⁶ Along with continuing education on relevant histological terms, standardization of the format and inclusion of this section would likely mitigate some comprehension issues. However, without any overarching rules or regulations for this section between and amongst institutions, the inclusion and content of this section are left entirely to the individual pathologist's discretion.

LITERATURE REVIEW

The first step in alleviating the aforementioned disparities among both gross and microscopic descriptions is examining how they are currently used by both pathologists and clinicians. With this baseline of knowledge, improvements may be suggested to increase the consistency and efficiency of communication in these sections to work towards standardization. Despite widespread acknowledgment of the importance of gross descriptions, to our knowledge, a study has yet to be performed which examines specifically the utility of gross descriptions to pathologists and clinicians.¹¹ In Manitoba, as pathologists' assistants and residents are solely responsible for grossing, the closest pathologists may get to seeing the specimens may be the gross description. Yet, experienced pathologists may not always require this information to execute their assessment. As CAP protocol necessitates microscopic confirmation of disease presence and staging parameters, pathologists may extract the majority, if not all of the information in the final diagnosis section from their microscopic findings.²⁴ This is especially feasible in routine and benign cases where the gross description may yield the same degree of information as the examination of a single microscopic slide. For example, in a case of a hysterectomy specimen excised for benign fibroids, the final diagnosis may simply be the microscopically confirmed presence of fibroids. In this instance, elements traditionally included in the gross description such as the dimensions of the uterus and fibroids may be of little diagnostic value to the pathologist and clinician. In this scenario, it seems conceivable that pathologists may simply skim the gross description for pertinent information such as measurements, block descriptions or simply forgo reading it altogether if routine sections are taken. This may also be true for biopsies whose gross descriptions may be practically identical for all specimens. Though, the gross description section may be the ideal location for the

grossing individual to convey to the pathologist comments on the anticipated adequacy of the specimen for histologic assessment.³⁴ Certain situations may logistically warrant a more thorough examination of this section, such as if an explanation is required for unexpected findings or if gross descriptors are relevant to staging or prognosis. Nonetheless, it is still unclear if pathologists routinely and thoroughly read the gross description, and if they do not, what might prompt them to.

The importance of gross descriptions to clinicians is perhaps even more difficult to ascertain as they may extract the bulk of the information used to guide adjuvant treatment and patient prognosis from the final diagnosis section of the report. Even important elements that may be exclusively assessed during the gross evaluation, such as the size of a malignant lesion when necessary for staging, are included in the synoptic template in the final diagnosis section.²⁴ This may result in a redundant read for clinicians particularly if they were the ones who excised the specimen. The potential discrepancies between the data of the gross descriptions and the final diagnosis may be confusing to clinicians and would be an additional reason to ignore the gross description. Additionally, for clinicians who may perform multiple biopsies weekly, reading the gross descriptions may be a potentially repetitive, time-consuming, and futile task. So far, few studies have documented if clinicians routinely review this specific section of the pathology report.^{6,11} When Powsner et al. provided a questionnaire to 34 clinicians after reviewing pathology reports, the question requiring examination of the gross description section was always answered correctly.⁶ Though clinicians may have possibly examined these reports more thoroughly than they typically do in their day-to-day practice, it does suggest that clinicians comprehend the gross description without additional interpretation and that they are likely not prompted to skip it due to potential misunderstandings. More recently, Heller¹¹ surveyed 91

health care professionals including gynecologists, dermatologists, and nurse practitioners and 94% answered that they always read the gross description in pathology reports. Though this number may be higher than average due to the large proportion of specialists and potentially inaccurate self-reporting, it does hint that clinicians routinely find the information in the gross description section clinically relevant. Stevenson et al.¹⁸ also surveyed clinicians who all answered that they always read pathology reports, though they surveyed family physicians and did not question them on the individual sections of the report.

Even fewer studies have examined the utility of microscopic descriptions in pathology reports. To our knowledge, there have been no studies to date that have examined how frequently pathologists write microscopic descriptions, and what may motivate them to do so. The Association of Directors of Anatomic and Surgical Pathology¹⁵ recommend including a microscopic description when the pathologist deems it appropriate, however, they do not provide specific examples of when it may be deemed appropriate, and they advise that it need not be included in every report. Powsner et al.⁶ reported that their institution's convention is to only include histologic descriptions in unique or difficult cases as they anticipate that clinicians incorrectly interpreting histology may lead to more severe misunderstandings. This perception of clinicians not understanding the microscopic appearance of disease may be widespread among pathologists, with Mies¹ suggesting that histologic attributes of disease are incomprehensible for non-pathologist physicians and Fiscella³ even advocating for pathologists to speak to patients directly to better explain their pathologic findings. The accrediting bodies of laboratories (CAP and other organizations) do not require microscopic descriptions in the report.

It has been suggested that the microscopic description section of pathology reports serves as a means for pathologists to communicate with other pathologists or with highly specialized

non-pathologist physicians such as hepatologists and nephrologists.¹ When used in this manner, the histological description may reinforce the pathologist's conclusion and outline their thought process. This may be particularly valuable in cases with challenging differential diagnosis or with a level of uncertainty, or if a case is reviewed by another pathologist, as is the case during consultations, medicolegal proceedings, audits or when reviewing subsequent relevant specimens from the same patient or even as an educational tool during grand rounds presentations.

Pathology residents may also be more motivated to write a microscopic description as dictating histology may help them familiarize themselves with the variable histologic presentation of disease processes. Additionally, if pathologists wish to comment on other elements such as ancillary studies, tissue sufficiency, consultations, reference to previous relevant specimens, and thoughts on staging parameters they may choose to include a microscopic description.^{1,15}

Though, as previously mentioned, certain pathologists may include this information in the comments section.^{1,14} Finally, many pathologists may choose not to include this section unless absolutely necessary, particularly when accompanied by a lengthy synoptic report in the final diagnosis section designed to include all the clinically relevant information.²⁴

Despite the preconceived notions of certain pathologists, there does not appear to be any specific studies reporting whether clinicians routinely read, understand, and utilize the information present in the microscopic description sections of pathology reports. Bracamonte et al.¹⁰ did summarize that 72% of their attending clinicians and 50% of their resident clinicians always read the comment section in pathology reports. Though this study examined pathologist phrases conveying levels of certainty in the comments section and it was unclear if this section at their institution also frequently included histological descriptions and other information. While Powsner et al.'s surveyed clinicians did appear to have the most difficulty on questions

referencing histology, they only surveyed general surgeons who may not have the same intimate knowledge of specific disease processes as specialists do.⁶ Similarly, Zare-Mirzaie et al.¹⁶ reported that the medical students they quizzed had the most problems with specific terminology, though it was not expressly stated if this was histological terminology used in the microscopic description section. Additionally, the specialists surveyed by Heller¹¹ reported that they did not always understand pathology reports and though she did not verify which sections of the report were the most incomprehensible for them, she did find that 27% did not know the histological term spongiosis used in dermatopathology. It would correspond that if histology was not expressly taught to clinicians throughout their education or they were not in a highly specialized field and had not taken it upon themselves to learn it, they likely would not understand the jargon included in the microscopic description sections. It would also make sense that if they were aware of this limitation in themselves, they may skip reading this section to avoid unnecessary confusion, particularly if all the relevant information were included in the final diagnosis section. On the contrary, however, if clinicians do customarily read and fully understand the microscopic description section, how they then use this information in conjunction with the remainder of the report, to judge prognosis and guide adjuvant therapy has yet to be ascertained.

OBJECTIVE OF THESIS

With those elements in mind, this thesis serves to examine the as of yet unanswered questions regarding the utility of the gross and microscopic description sections of pathology reports to pathologists and clinicians. This was accomplished by surveying pathologists and clinicians and conducting a retrospective review of existing pathology reports. Pathologists were questioned on their use of gross descriptions when written by a pathologists' assistant or resident. If, as previously hypothesized, pathologists do not frequently rely on the information

included within this section to establish their final diagnosis, they may be attempted to skim through or skip over this section altogether particularly with current workloads at an all-time high. Pathologists were also surveyed on their approach to and motivation for writing a microscopic description and their opinion on how these sections of the report are utilized by clinicians. Since synoptic templates in the final diagnosis section may span over three pages, pathologists may be tempted to skip writing this section for conciseness especially if they do not think clinicians find value in it. Clinicians were surveyed on their use and comprehension of gross and microscopic descriptions to determine whether they routinely read, understand, and value these sections. As clinicians' workloads may be overwhelming particularly with an increased focus on efficiency and turnaround times, they may be prompted to skip these sections. This may be especially true if they already have to read a lengthy final diagnosis section and they either do not understand or do not value the content in the other sections. Finally, existing pathology reports were reviewed to investigate the presence/ absence and composition of microscopic descriptions. Expanded knowledge on this subject will provide an overview of the current usage and contents of gross and microscopic descriptions as well as highlighting common discrepancies and issues. In turn, this may provide a baseline of knowledge amenable to improvements, which in turn may allow standardized report format and content increasing communication clarity and efficiency.

MATERIALS AND METHODS

This study was granted institutional approval by the University of Manitoba Health Research Ethics Board (HS23742) and consisted of three parts.

PART I

For the first part of this study, an e-mail was sent on June 22nd, 2020, to invite practicing anatomical pathologists to participate in two anonymous voluntary online surveys through the Survey Monkey website. The anatomical pathologists invited to participate include those working for Shared Health in Winnipeg and Brandon, one working for Dynacare in Winnipeg and a recent graduate of the anatomical pathology residency in Winnipeg currently working in the United States. Participation in both surveys was taken as consent and participants were not compensated.

The first survey for pathologists consisted of a consent disclosure statement and 16 questions including ten multiple-choice questions where pathologists answered always, usually, rarely, or never on their approach to reading gross descriptions and their perceived opinions on how clinicians and patients utilize gross descriptions in pathology reports. Additionally, pathologists were asked two multiple-choice questions on whether they preferred narrative or synoptic gross descriptions, two select all that apply questions on why they may not read a gross description and what may prompt them to read a gross description if it is not routine practice for them and finally one optional long answer question for any other comments they may have.

The second survey consisted of 12 questions including nine multiple-choice questions where pathologists answered always, usually, rarely, or never on their approach to including microscopic descriptions in pathology reports and their perceived opinion on whether clinicians understand and utilize this information. Additionally, pathologists were asked two select all that

apply questions on why they may write a microscopic description if it is not routine practice for them and finally one optional long answer question for any other comments they may have. A full list of both survey questions and answers is included in Appendix A.

Two reminder emails to complete both surveys were sent to the anatomical pathologists on August 26th, 2020, and October 30th, 2020, and the online surveys were closed on November 13th, 2020. In total, 34 pathologists answered the first survey, and 33 pathologists answered the second survey. The pathologists did not have to fully complete either survey for their responses to be included in the study results.

PART II

The second part of this study involved surveying several groups of clinicians who routinely submit specimens for pathological evaluation. These clinicians consisted of various specialists and general practitioners including but not limited to dermatologists, gastroenterologists, nephrologists, urologists, gynecologists, pulmonologists, general surgeons, and head and neck surgeons. Clinicians were grouped into one of eight groups depending on their practice: general practitioner and family medicine, internal medicine, medical oncology, radiology, gynecology, dermatology, surgery, or other. Multiple e-mails were sent out starting on January 15th, 2021, with an invitation to participate in an anonymous voluntary online survey through the Survey Monkey website. Participation in the survey was taken as consent and participants were not compensated.

This survey consisted of a consent disclosure statement and 18 questions. This included ten multiple-choice questions where clinicians answered always, usually, rarely, or never on their approach to reading and how well they understand different sections of pathology reports.

Additionally, there were three select all that apply questions on which aspects of the different sections of the pathology report the clinicians find the most valuable, two multiple-choice questions on the clinicians' specialty, one multiple choice question on whether the clinician has contacted a pathologist requiring clarification on gross descriptions, one multiple choice question on which part of the pathology report they find the most valuable and finally one optional long answer question for any other comments they may have. A full list of survey questions and answers is included in Appendix B.

A reminder to complete the survey was sent to the groups of clinicians approximately one month after the initial email. In total there were 187 respondents. The clinicians did not have to answer all the questions or both surveys for their responses to be included in the study results.

PART III

The third part of the study consisted of a retrospective review of final pathology reports obtained from the CoPath database. In total, 380 reports generated by three Winnipeg hospitals: Health Sciences Centre (HSC), St Boniface Hospital (STB), and Grace General Hospital (GGH) as well as from Westman Regional Laboratories (WRL) in Brandon were reviewed. The reviewed reports were for specimens most frequently submitted to pathology: dermatological, gastrointestinal (hepatic/ upper gastrointestinal tract/ lower gastrointestinal tract), pulmonary, head and neck, breast, genitourinary (kidney/ prostate/ bladder), and gynecological (uterus/ cervix/ endometrium) including both biopsies and excisional specimen.

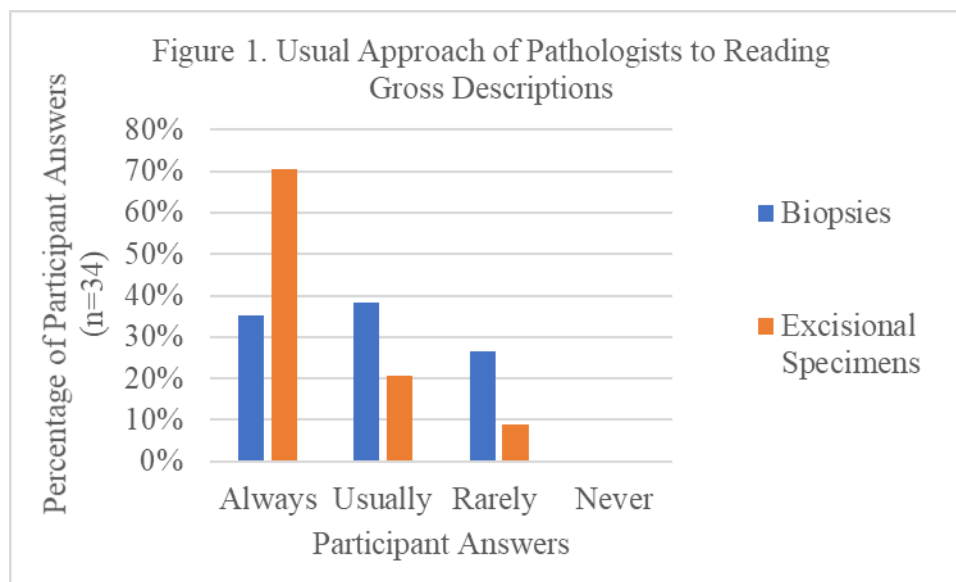
The final pathology reports reviewed were selected randomly. Once they were selected each report was reviewed for the following parameters: the hospital at which it was accessioned (HSC/ STB/ GGH/ WRL), the specimen size (biopsy/ excisional specimen), specimen type

(dermatological, gastrointestinal, etc.), final diagnosis section report format (synoptic/ narrative), final diagnosis (benign/ malignant), microscopic description (present/ absent), comment (present/ absent), histological description (included in the microscopic description, included in the comments, absent), differential diagnoses (included in the microscopic description, included in the comments, absent), relevant previous pathology (included in the microscopic description, included in the comments, absent), ancillary studies performed (included in the microscopic description, included in the comments, absent) and consultation (present/ absent). The review of final pathology reports took place between October 2020 and March 2021.

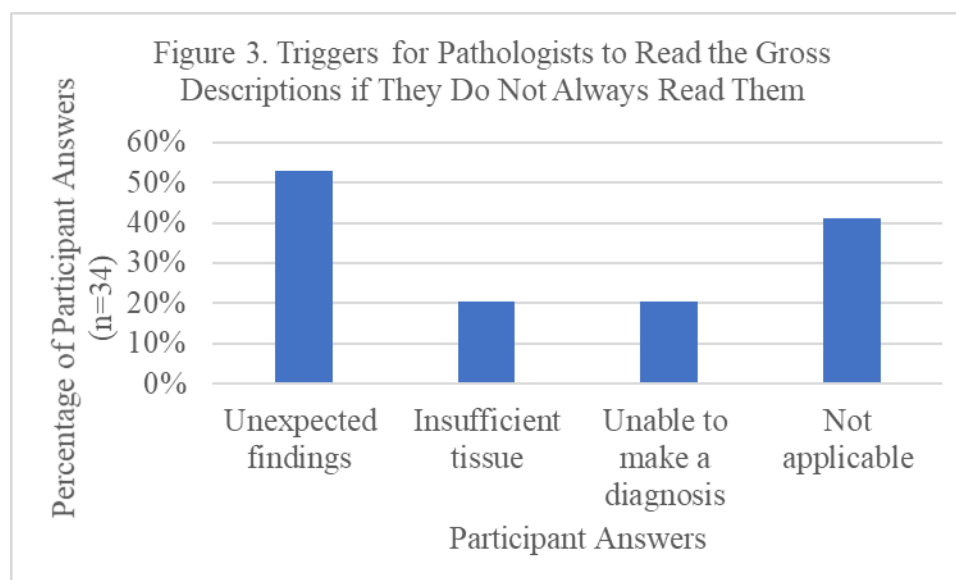
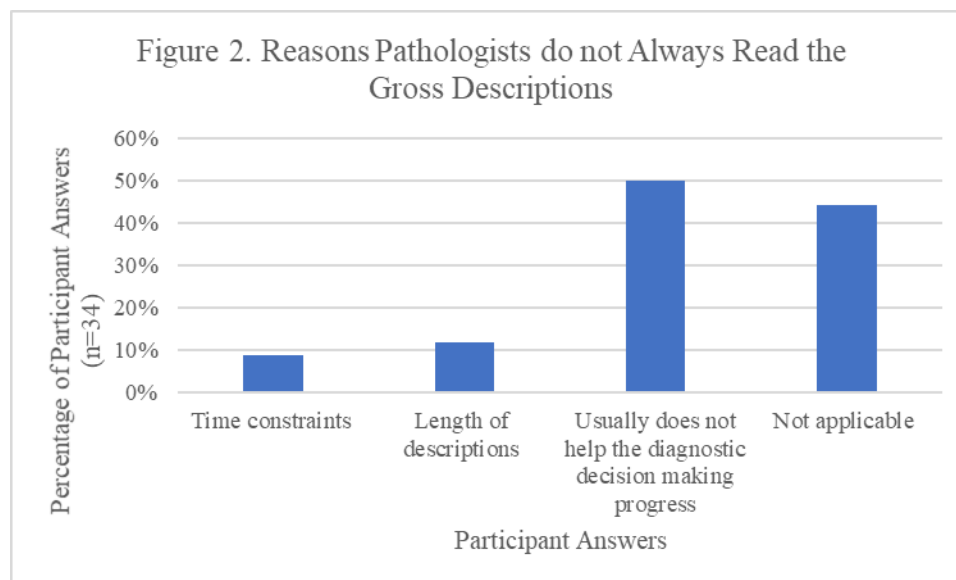
RESULTS

PART I

The first survey demonstrated a divide in pathologist approaches to reading gross descriptions based on the 34 responses. Overall pathologists appeared more inclined to always read the gross descriptions of excisional specimens 70.59% (24/34) compared to 35.29% (12/34) for biopsies (Figure 1). Pathologists also reported different approaches to reading gross descriptions with 47.06% (16/34) reading them word by word and 50% (17/34) glancing through them and focusing on specific elements (e.g. measurements). (Appendix A.) Pathologists were also split between the format they preferred for both biopsies and excisional specimens as 47.06% (16/34) and 48.48% (16/33) respectively preferred narrative format as opposed to synoptic templates (Appendix A.).

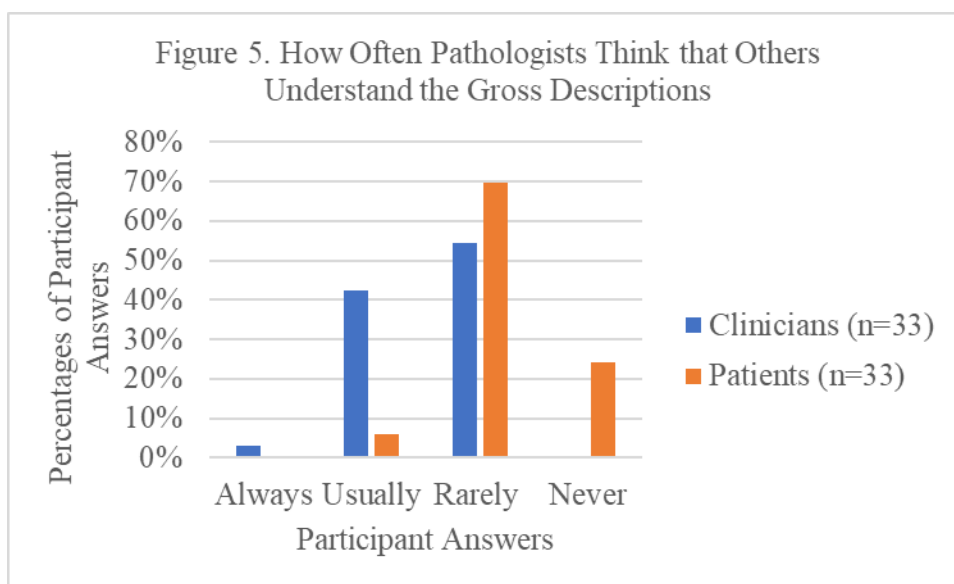
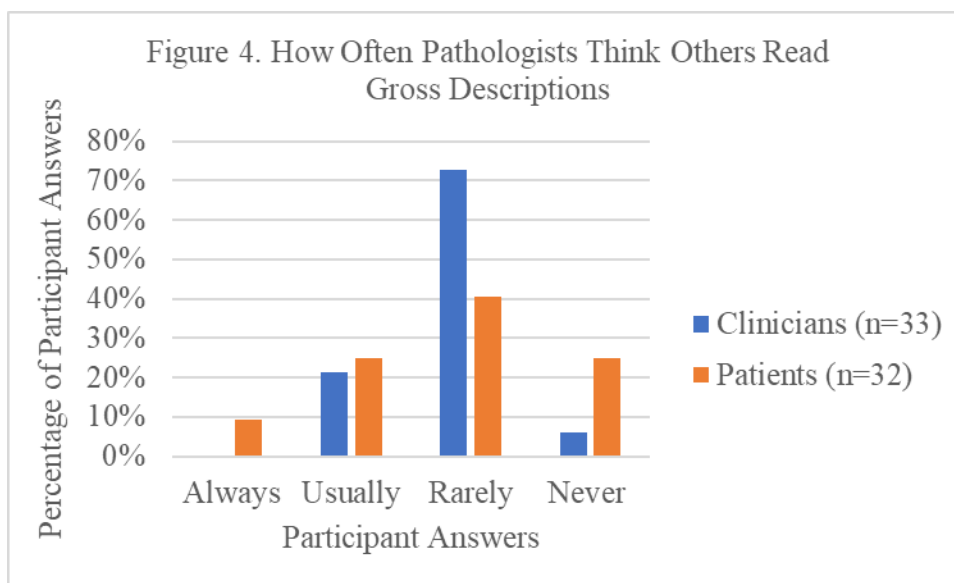


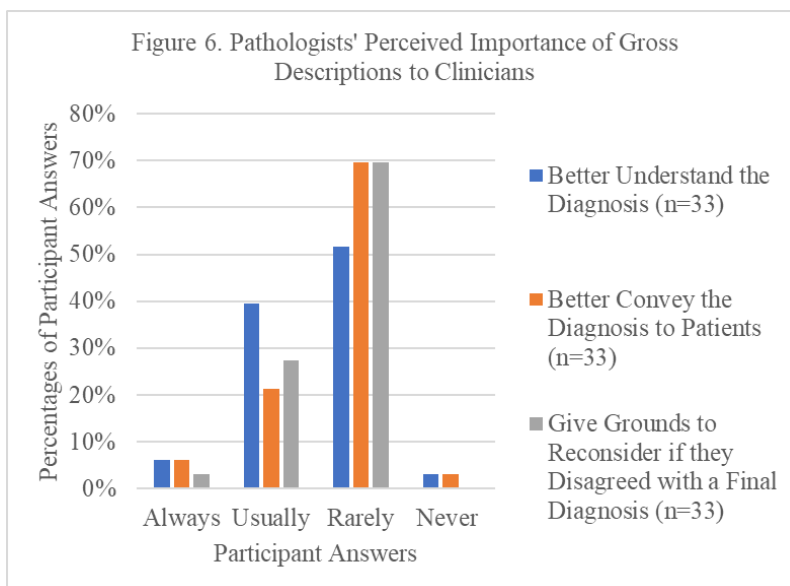
If pathologists stated they did not always read the gross description the most commonly selected reason was that reading the gross description usually did not help the diagnostic decision-making process (89.47% 17/19) with the length of gross descriptions (21.05% 4/19) and time constraints (15.79% 3/19) less commonly selected reasons (Figure 2). Pathologists listed unexpected findings as the most selected motivator to read the gross descriptions if they did not always read them (90.0% 18/20) with insufficient tissue and unable to make a diagnosis less commonly selected by pathologists (both 35.00% 7/20) (Figure 3.) Though minor grammatical errors rarely occur, when present in the gross description, two-thirds of pathologists reported that they rarely found them distracting (66.67% 22/33) while one-third of pathologists indicated that they usually found them distracting (33.33% 11/33). (Appendix A.).



Overall, pathologists responded that they thought that the gross descriptions in pathology reports were rarely read and rarely understood by both clinicians and patients. Out of the surveyed pathologists, 78.79% (26/33) answered that they thought that gross descriptions were rarely or never read by clinicians and 65.63% (21/32) answered they were rarely or never read by patients (Figure 4.). However, only 54.55% (18/33) of pathologists answered that they thought gross descriptions were rarely or never understood by clinicians while 93.94% (31/33) answered

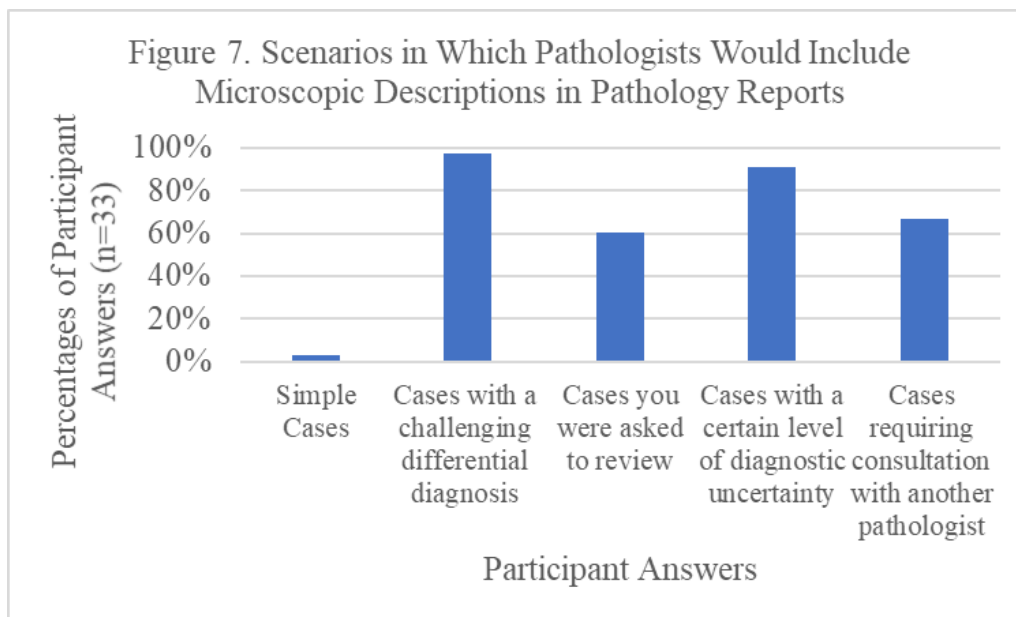
they were rarely or never understood by patients (Figure 5.). Finally, the majority of pathologists answered that they thought the gross description would rarely or never help clinicians convey the diagnosis to the patient (72.72% 24/33), rarely or never give grounds to reconsider if they disagreed with the diagnosis (69.70% 23/33), and to rarely or never help clinicians grasp the diagnosis (54.55% 18/33) (Figure 6.).



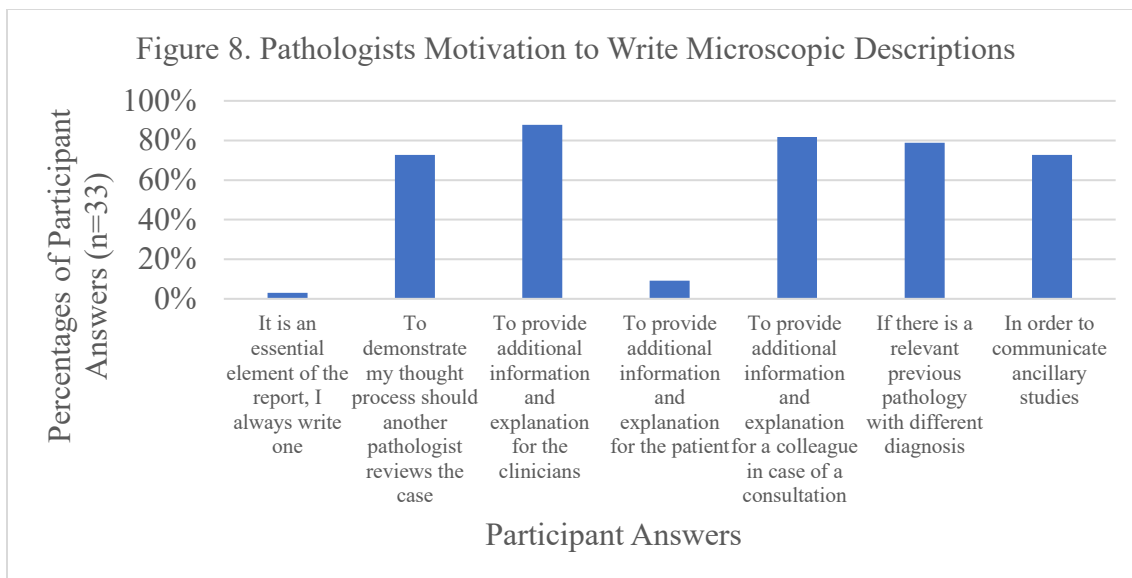


The second pathologist survey revealed similar approaches to writing microscopic descriptions. The majority of the 33 responding pathologists indicated they rarely wrote microscopic descriptions for biopsies (84.85% 28/33) and large excisions (81.82% 27/33) (Appendix A) and accordingly rarely felt that microscopic descriptions should be included in the pathology reports for biopsies (81.25% 26/32) and excisional specimens (78.13% 25/32) (Appendix A).

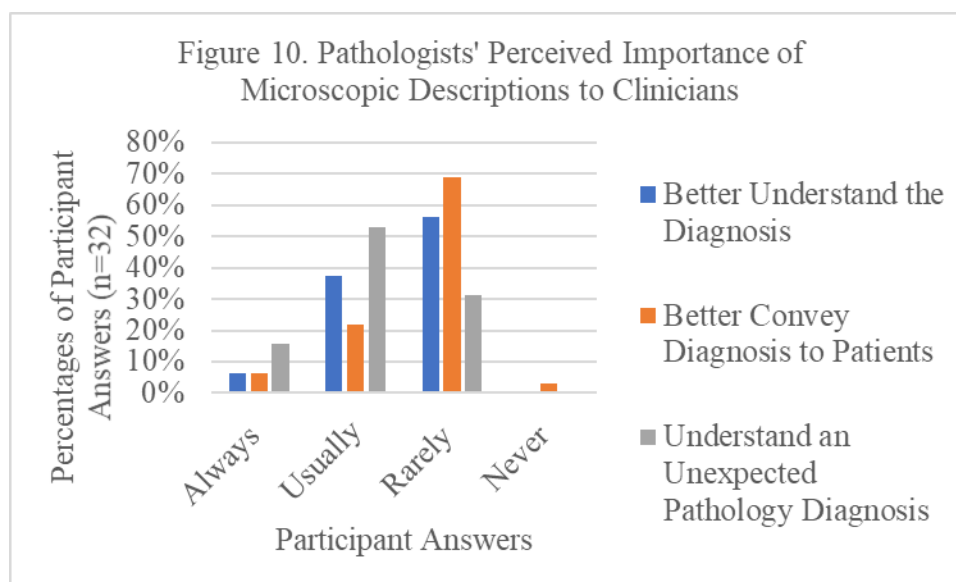
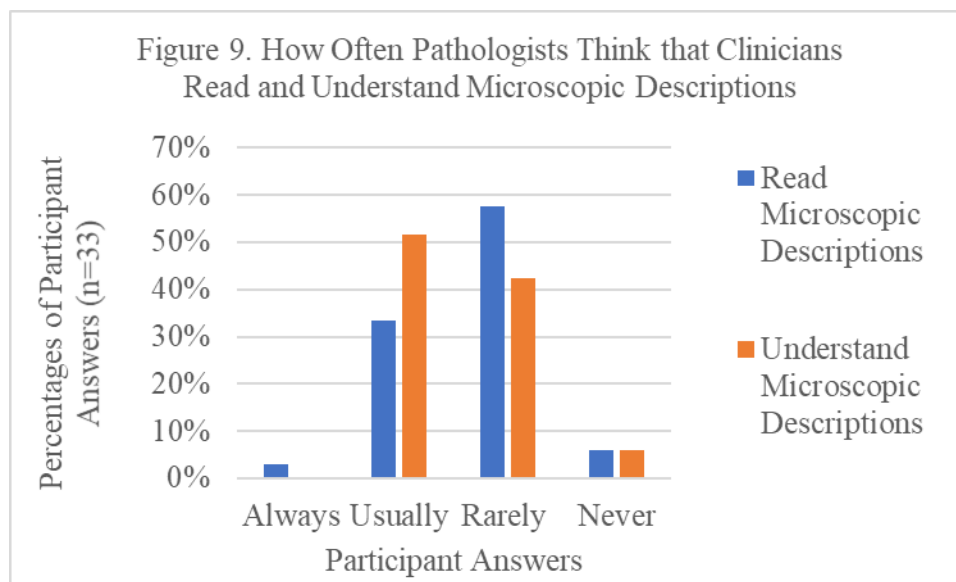
Almost all the pathologists answered that they would include microscopic descriptions in pathology reports in the following scenarios: a challenging differential diagnosis (96.97% 32/33) and cases with a certain level of diagnostic uncertainty (90.91% 30/33) (Figure 7). While the majority of pathologists indicated that they would include microscopic descriptions in cases requiring consultation with another pathologist (66.67% 22/33) and cases they were asked to review (60.61% 20/33), only one pathologist indicated they would include microscopic descriptions in simple cases (3.03% 1/33) (Figure 7).



The most common pathologist motivations to write microscopic descriptions were to provide additional information and explanation for the clinicians (87.88% 29/33) and to provide additional information for a colleague in case of a consultation (81.82% 27/33) (Figure 8.). Other frequently selected answers included if there is relevant previous pathology with a different diagnosis (78.79% 26/33), to demonstrate my thought process should another pathologist review my case and to communicate ancillary studies (both 72.73% 24/33) (Figure 8.). Few pathologists chose to provide additional information and explanation for the patient (9.09% 3/33) and only one pathologist chose it is an essential element of the report, I always write one (3.03% 1/33) as their motivation (Figure 8).



Over half of pathologists answered that they thought that clinicians rarely read the microscopic descriptions in pathology reports (57.58% 19/33) yet over half answered that they thought that clinicians usually understand the microscopic descriptions in pathology reports when they read them (51.52% 17/33) (Figure 9). While most pathologists indicated that they thought by reading the microscopic descriptions clinicians would rarely be able to better convey the diagnosis to the patient (68.75% 22/32) and rarely better understand the diagnosis (56.25% 18/32), a little over half of the pathologists (53.13% 17/32) answered that if a clinician received an unexpected diagnosis, reading the microscopic description would usually help them to understand that diagnosis (Figure 10).



PART II

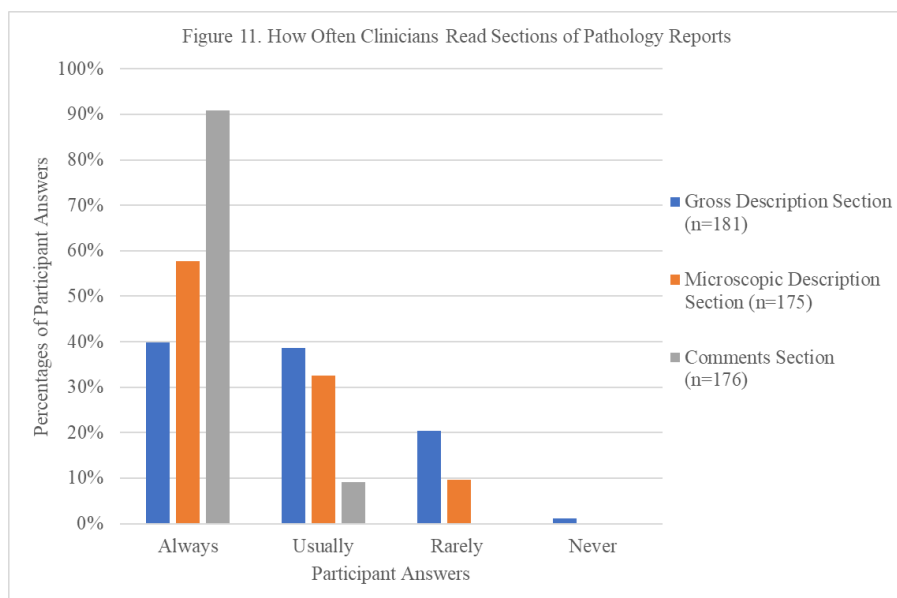
A variety of practicing clinicians responded to the clinician survey with 187 final respondents. Out of those respondents, 37.63% (71/186) indicated they were general practitioners and 62.37% (116/186) reported they were specialists (Table 1). Clinician specialists reported a wide assortment of practices with internal medicine (43 respondents), and oncology

(32 respondents) the most selected specialties (Appendix B) A full breakdown of survey respondents' self-declared practices and how they were grouped is present in Appendix B.

Most clinicians reported a similar approach to reading pathology reports with 95.05% (173/182) answering that they always read them (Appendix B). For those who answered that they did not always read pathology reports only one clinician indicated that time constraints were what usually prevented them from reading them while 55.56% (5/9) of clinicians indicated that only relying on the final diagnosis section was usually what prevented them from reading the reports (Appendix B). However, 100% (9/9) of the clinicians who answered they did not always read the pathology reports also indicated that they rarely or never had a third party (physician assistant, nurse, secretary, etc.) summarize the report for them (Appendix B).

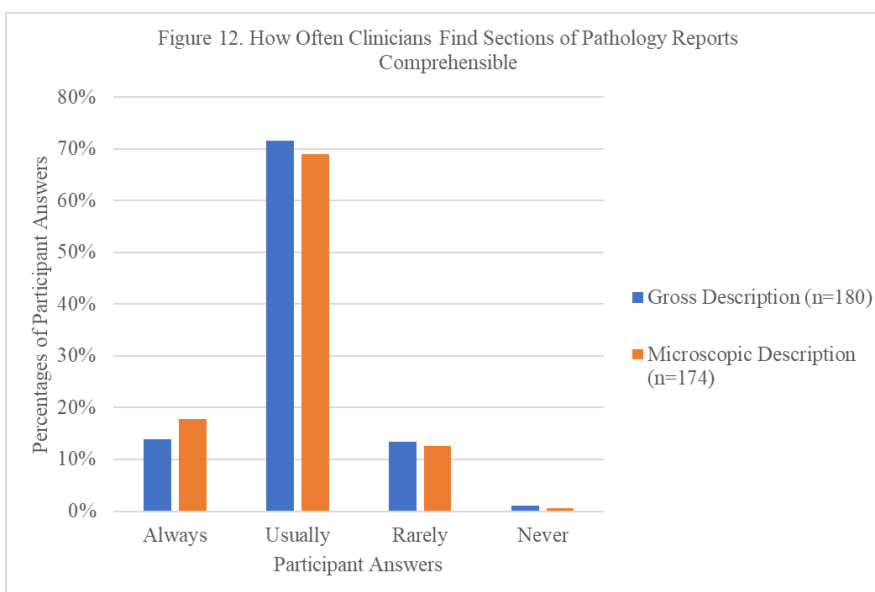
Out of the sections of pathology reports addressed in this survey, clinicians appeared to most frequently read the comments section with 90.91% (160/176) indicating that they always read the comments section and the remainder indicating that they usually read this section (Figure 11.). The microscopic and gross descriptions were less frequently read by clinicians with only 57.71% (101/175) and 39.78% (72/181) respectively answering that they always read these sections (Figure 11.). Further, the gross description section appeared to be the least commonly read by clinicians with 20.44% (37/181) indicating they rarely read this section, compared to only 9.71% (17/175) answering they rarely read microscopic descriptions and 0% (0/176) answering they rarely read the comments section (Figure 11.). When broken down by specialty other clinicians and gynecologists most commonly answered they always read the gross description, 83.33% (5/6) and 66.67% (2/3) respectively while radiologists and surgeons most commonly answered they rarely read the gross description, 75.0% (6/8) and 38.46% (5/13) respectively and with one dermatologist (12.5% 1/8) and one general practitioner (1.44% 1/69)

answering they never read the gross description. Microscopic descriptions were always read by 83.33% of internists (35/42), 73.33% of oncologists (22/30), and 66.67% of gynecologists (2/3) yet rarely read by 50.0% of radiologists (4/8) and 16.92% of general practitioners (11/65). When separating internists by the grouped specialties there did not appear to be any appreciable difference in their approach to reading the microscopic description apart from nephrologists (87.5% 7/8) and general internists (75% 6/8) being the most common specialties to answer they always read the microscopic description. There was no appreciable difference between clinician groups' answers on how frequently they read the comments section.



Most clinicians answered that they found both gross and microscopic descriptions comprehensible with 71.67% (129/180) of clinicians indicating that they usually found gross descriptions comprehensible and 68.97% (120/174) indicating that they usually found microscopic descriptions comprehensible (Figure 12.). When broken down by specialty gynecologists (33.33% 1/3) and internists (27.91% 12/43) most commonly answered that they always found the gross description comprehensible while only one dermatologist (12.5% 1/8)

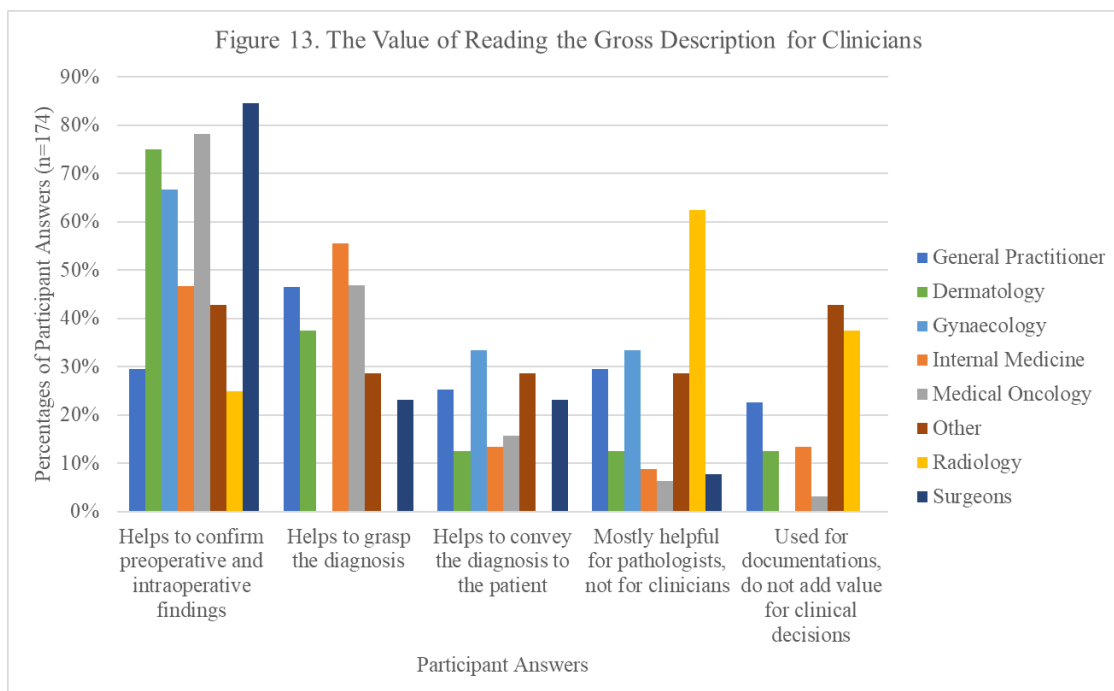
and one general practitioner (1.47% 1/68) indicated they never and few radiologists (42.86% 3/7) and general practitioners (17.65% 12/68) indicated that they rarely found it comprehensible. For microscopic descriptions, surgeons (30.77% 4/13), internists (28.57% 12/42), and dermatologists (28.57% 2/7) most frequently selected they always found the microscopic description comprehensible. Specifically, when the clinician specialties were divided into their self-declared practices it became apparent that nephrologists (87.5% 7/8) were the group to most frequently report that they always found the microscopic description comprehensible with the most other specialties divided between always and usually finding it comprehensible. While only one general practitioner (1.56% 1/64) answered that they never and several gynecologists (66.67% 2/3) and radiologists (28.57% 2/7) answered they rarely found it comprehensible.



When asked the value of reading gross descriptions, the most frequently selected clinician responses were that they help to confirm preoperative and intraoperative findings (52.3% 91/174) and help to grasp the diagnosis (46.55% 81/174) (Figure 13.). When separated by specialty type, helps to confirm preoperative and intraoperative findings was most commonly

selected by dermatologists (85.71% 6/7), surgeons (84.62% 11/13), and medical oncologists (78.13% 25/32), while helps to grasp the diagnosis was most commonly selected by internists (58.14% 25/43), general practitioners (50.77% 33/65), and medical oncologists (46.88% 15/32). Less commonly selected responses included mostly helpful for pathologists, not for clinicians (21.26% 37/174), helps to convey the diagnosis to the patient (20.69% 36/174), and used for documentation, but do not add value for clinical decisions (17.24% 30/174) (Figure 13.). Broken down by specialty, mostly helpful for pathologists, not for clinicians was most frequently selected by radiologists (62.5% 5/8) and gynecologists (33.33% 1/3), helps to convey the diagnosis to the patient was most frequently selected by gynecologists (33.33% 1/3) and other physicians (33.34% 2/6), and finally, used for documentation, but do not add value for clinical decisions was most frequently selected by other physicians (50% 3/6) and radiologists (37.50% 3/8) (Figure 13.).

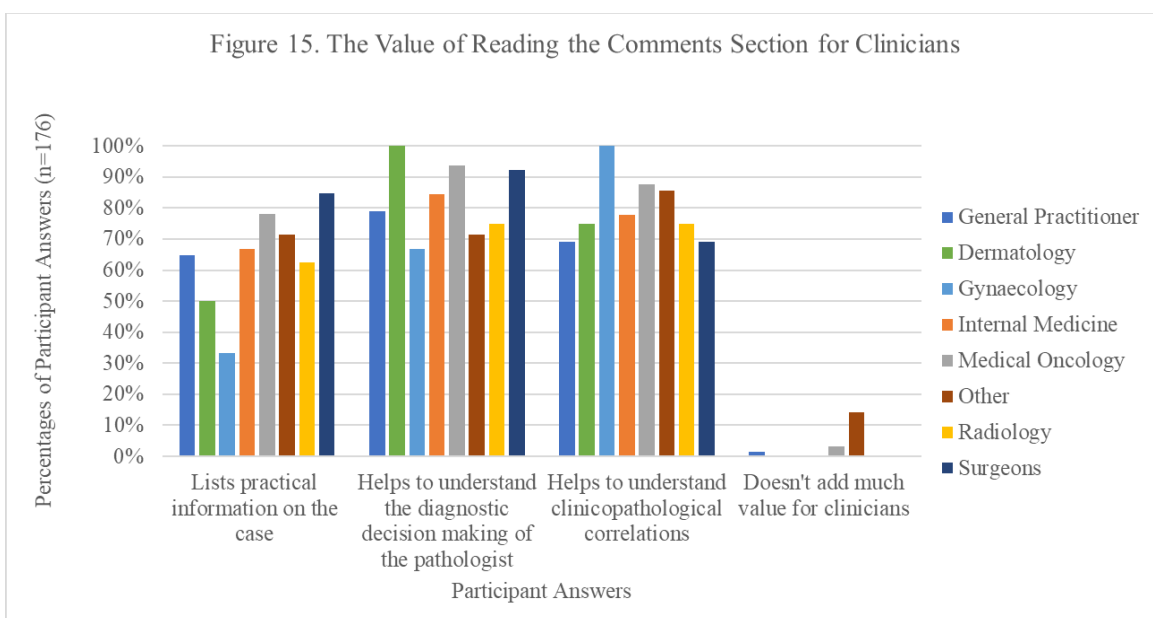
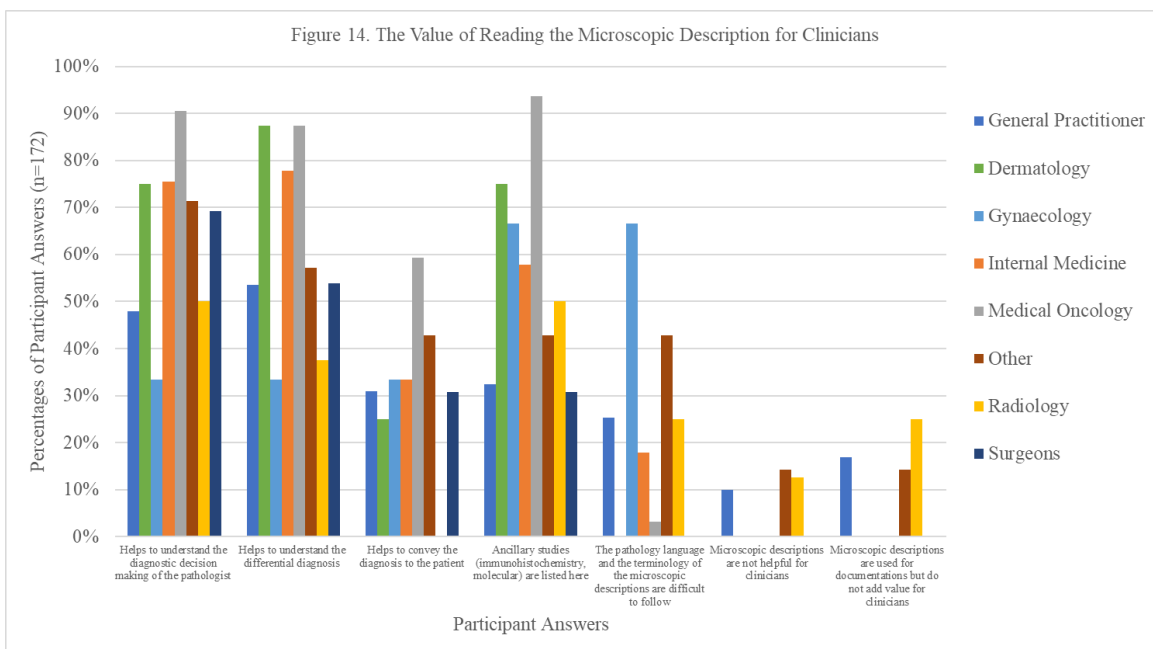
Less than half of clinicians indicated that they had previously called pathologists to clarify information listed in the gross description (40.57% 71/175) and, out of those whose practice it applied to, 51.64% (63/122) of clinicians indicated they would usually be more inclined to read the gross description of a large specimen (e.g. skin ellipse, lung wedge) as opposed to a biopsy (Appendix B).



When asked the value of reading microscopic descriptions, the most frequently selected clinician responses were helps to understand the differential diagnosis (71.51% 123/172), helps to understand the diagnostic decision making of the pathologist (70.93% 122/172), and ancillary studies are listed here (56.98% 98/172) (Figure 14.). When separated by specialty type, helps to understand the differential diagnosis was most commonly selected by dermatologists (100% 7/7), medical oncologists (90.32% 28/31), and internists (79.55% 35/44). Helps to understand the diagnostic decision-making process of the pathologist was most frequently selected by medical oncologists (93.55% 29/31), other physicians (83.33% 5/6), and internists (77.27% 34/44). Finally, ancillary studies are listed here was most frequently selected by medical oncologists (96.77% 30/31) and dermatologists (85.71% 6/7). The least commonly selected responses included microscopic descriptions are used for documentation but do not add value for clinicians (8.72% 15/172), and not helpful for clinicians (5.23% 9/172) (Figure 14.). More specifically, microscopic descriptions are used for documentation but do not add value for clinicians was

most frequently selected by radiologists (25% 2/8), general practitioners (19.05% 12/63), and other physicians (16.67% 1/6), while not helpful for clinicians was also most frequently selected by other physicians (16.67% 1/6), radiologists (12.5% 1/8), and general practitioners (11.11% 7/63).

The majority of clinicians appeared to agree regarding the value of reading the comments section with helps to understand the diagnostic decision making of the pathologist (89.20% 157/176), helps to understand the clinicopathological correlations (80.68% 142/176), and lists practical information on the case (73.30% 129/176) the most commonly selected answers (Figure 15.). When separated by specialty, helps to understand the diagnostic decision making of the pathologist was most frequently selected by dermatologists (100% 8/8), medical oncologists (96.77% 30/31), and surgeons (92.31% 11/12). Helps to understand the clinicopathological correlations was most frequently chosen by gynecologists (100% 3/3), other physicians (100% 6/6), and medical oncologists (90.32% 28/31), while lists practical information on the case was most frequently selected by surgeons (84.62% 11/13) and medical oncologists (80.65% 25/31). Overall few clinicians responded that the comments section does not add much value for clinicians (1.70% 3/176) with this option chosen most often by other physicians (16.67% 1/6) (Figure 15.).



Finally, 59.43% (104/175) of clinicians chose the comments section as the most important section of the pathology report after the final diagnosis section (Appendix C). Only 36.57% (64/175) of clinicians selected the microscopic description section as the most important section and 4.00% (7/175) chose the gross description section (Appendix C). When divided by specialties, comments were selected as the most important section after the final diagnosis by

78.13% (50/64) of general practitioners, 75% (6/8) of radiologists, and 66.67% (2/3) of gynecologists while microscopic description was selected most often by dermatologists (75% 6/8). The remaining specialties appeared relatively split between microscopic descriptions and comments with 60% (18/30) of oncologists choosing microscopic descriptions and the remaining 40% (12/30) choosing comments, 52.38% (22/42) of internists choosing comments, and 42.86% (18/42) choosing microscopic descriptions, and 46.15% (6/13) each of surgeons choosing microscopic descriptions and comments. When dividing the specialties grouped within internal medicine and medical oncology into their categories it became apparent that the majority of clinician specialties were relatively evenly split between favoring comments and microscopic descriptions apart from pulmonologists (66.67% 2/3) and general internists (66.67% 4/6) who both preferred the comments and nephrologists (62.5% 5/8), endocrinologists (75% 3/4), and general medical oncologists (69.23% 18/26) who chose microscopic descriptions.

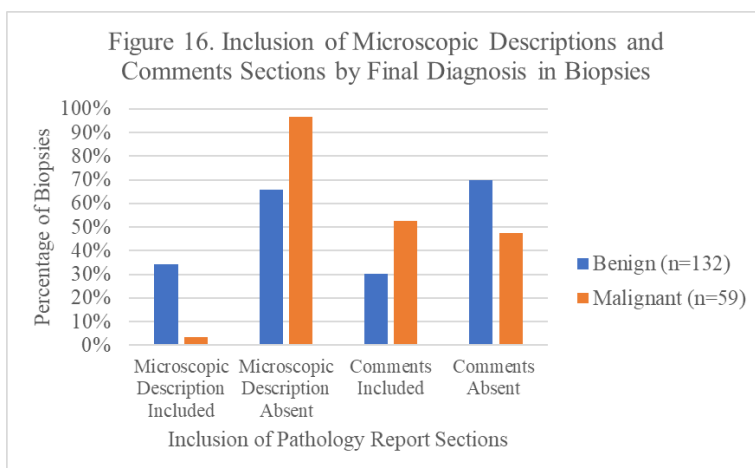
PART III

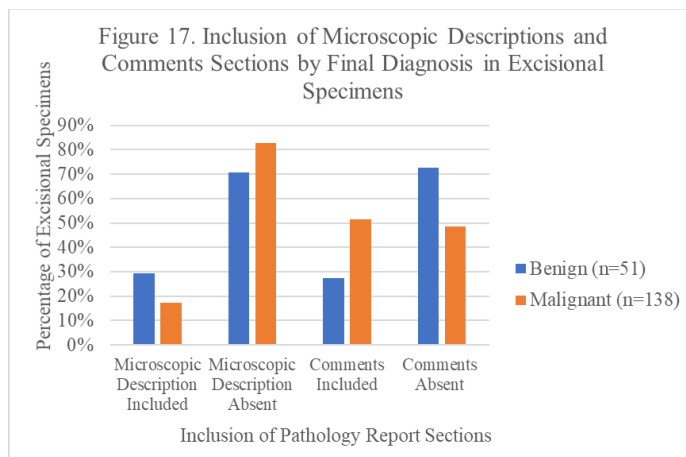
In total, 380 pathology reports were reviewed with 123 specimens accessioned at St Boniface Hospital (66 biopsies and 57 excisional specimens), 159 specimens accessioned at Health Sciences Centre (71 biopsies and 88 excisional specimens), 64 specimens accessioned at Westman Regional Laboratories (44 biopsies and 20 excisional specimens), and 34 specimens accessioned at Grace General Hospital (10 biopsies and 24 excisional specimens) (Appendix C). Out of all the biopsies reviewed, only 30.89% (59/191) were malignant while 72.49% (138/189) of the excisional specimens reviewed were malignant (Appendix C).

As is in line with our accreditation requirements, synoptic templates were only used in the final diagnosis section of excisional specimens. For the final pathology reports of malignant

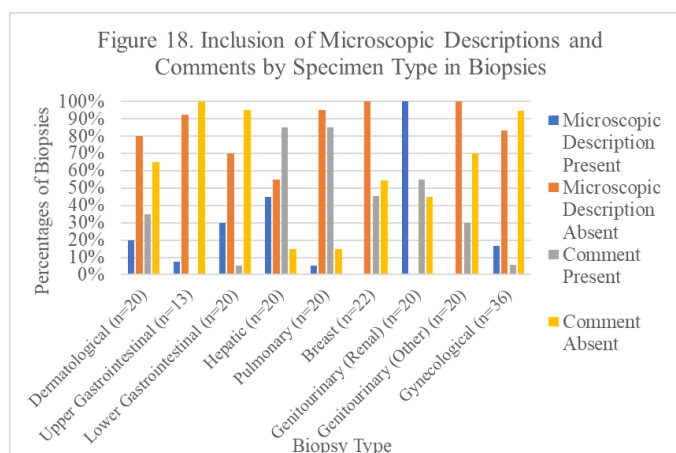
excisional specimens, 100% of lower gastrointestinal (8/8), pulmonary (22/22), prostate (20/20), and gynecological excisions (20/20) used a synoptic format, while the final diagnosis section of only 14.29% (2/14) of malignant dermatological and 31.25% (5/16) of malignant hepatic excisions, used a synoptic format (Appendix C.).

Overall, the microscopic description and comment sections were more commonly absent from the final pathology reports of both biopsies and excisional specimens. On average, for biopsies, the microscopic description section was included in only 24.61% (47/191) of the pathology reports whereas the comments section was included in 37.17% (71/191) of the reports (Figure 16.). For excisional specimens, the microscopic description section was included in only 20.63% (39/189) of the pathology reports whereas the comments section was included in 44.97% (85/189) of the reports (Figure 17.). When separated by final diagnosis type, microscopic descriptions were most commonly included in benign biopsies (34.09% 45/132) (Figure 16.) whereas comments were most commonly included in malignant specimens, whether biopsies (52.54% 31/59) or excisions (51.45% 71/138) (Figure 17.). Overall, there did not appear to be any appreciable difference between the inclusion of microscopic descriptions and comments by specimen size between the four hospitals (Appendix C).



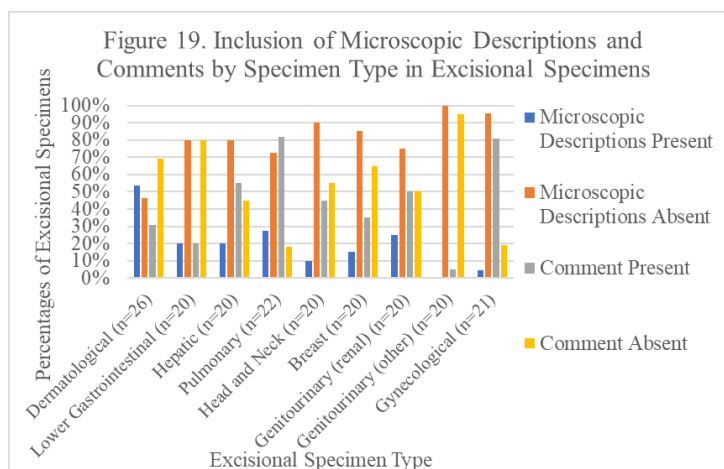


When separated by specimen type, the final pathology reports for renal (100% 20/20) and hepatic biopsies (45% 9/20) biopsies most frequently included a microscopic description, while none of the reports for prostate (0/20) and breast biopsies (0/22) included a microscopic description (Figure 18.). Similarly, the final pathology reports for pulmonary (85% 17/20), hepatic (85% 17/20), and renal biopsies (55% 11/20) most frequently included a comments section, while only 5% (1/20) of lower GI biopsy reports and no upper GI biopsy reports (0/13) included a comments section (Figure 18.)

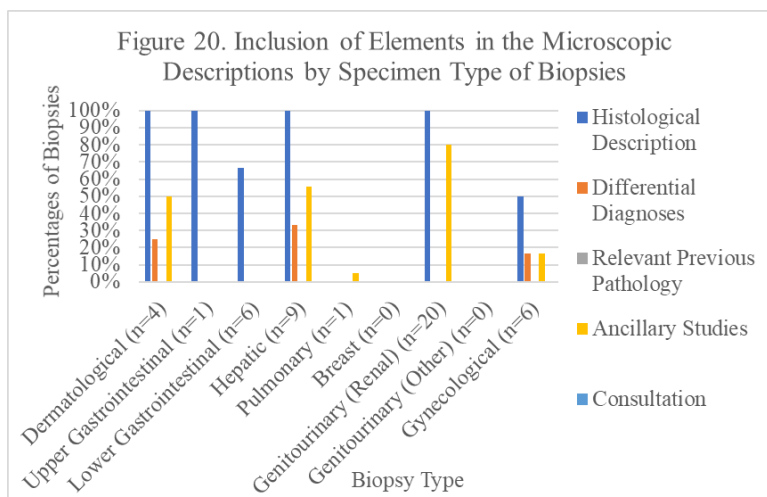


For excisional specimens, a microscopic description was most frequently included in the pathology reports for dermatological (53.84% 14/26) and pulmonary excisions (27.27% 6/22)

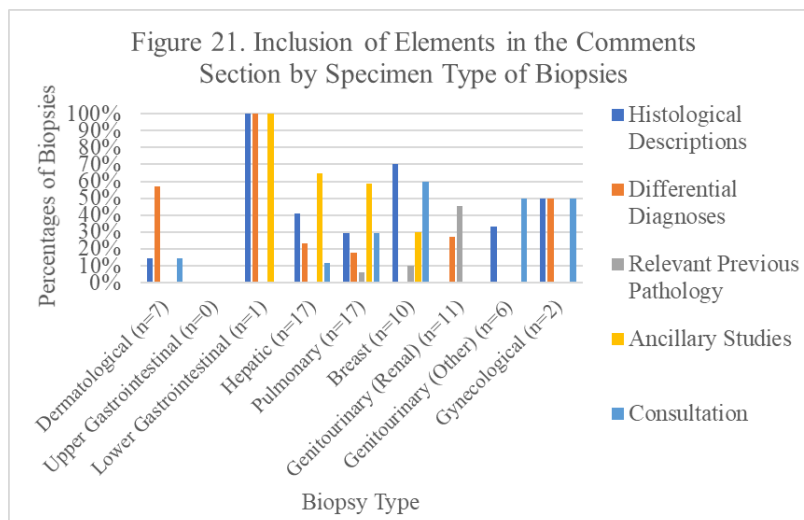
while microscopic descriptions were only included in 4.76% (1/21) of gynecological and no prostate pathology reports (0/20) (Figure 19.). In addition, the comments section was most commonly included in the final pathology reports of pulmonary (81.82% 18/22) and gynecological excisional specimens (80.95% 17/21), and only present in 20% (4/20) of lower gastrointestinal reports and 5% (1/20) of prostate excisions (Figure 19.).



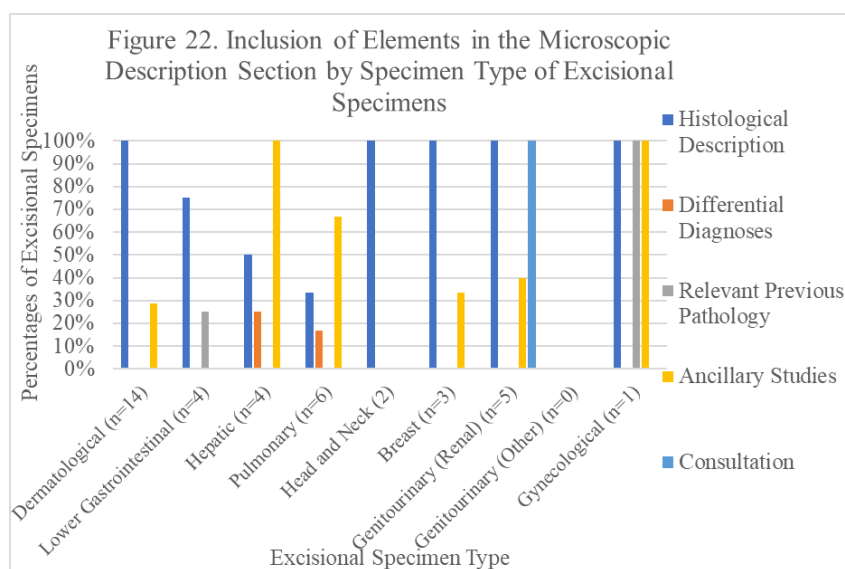
For biopsies, the most frequent elements included in the microscopic description section included histologic descriptions and the results of ancillary studies. Overall, out of all of the biopsies containing a microscopic description 87.23% (41/47) of these sections included a histological description with a large majority of that percentage made up of the microscopic descriptions of renal (42.55% 20/47) and hepatic biopsies (19.15% 9/47) (Figure 20.). Similarly, 55.32% (26/47) of biopsies with microscopic descriptions included the results of ancillary studies in this section mainly composed of renal (34.04% 16/47) and hepatic biopsies (10.64% 5/47) (Figure 20.).



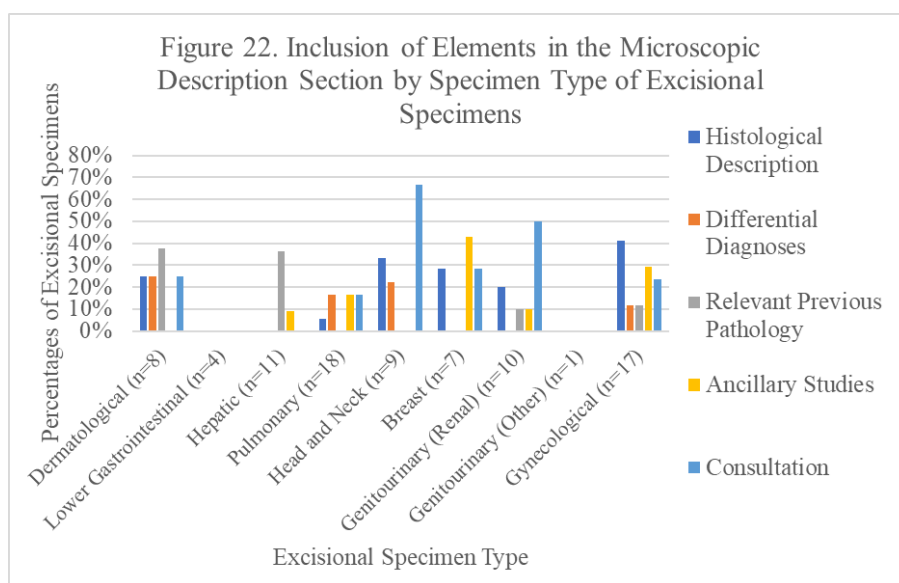
The most frequent elements included in the comments section of biopsies were also histological descriptions and the results of ancillary studies, however, differential diagnoses, and the acknowledgment of consultation with another pathologist were also frequently included. Out of the biopsies with comments sections in their pathology reports, 35.21% (25/71) included the results of ancillary studies, made up almost entirely of hepatic (15.49% 11/71) and pulmonary biopsies (14.08% 10/71) (Figure 21.). Similarly, 33.8% (24/71) of biopsies with comments included a histological description of the specimen in this section, distributed relatively evenly across all specimen types with breast and hepatic biopsies (9.86% 7/71) the most common (Figure 21.). Additionally, 25.35% (18/71) of the biopsy comments section included a description of consultation with another pathologist, with breast (8.45% 6/71) and pulmonary (7.04% 5/71) biopsies being the most common. Finally, 23.94% (17/71) of the biopsy comments section included a differential diagnosis, spread out fairly evenly throughout specimen types with dermatological and hepatic biopsies (5.63% 4/71) being the most common (Figure 21.).



The microscopic descriptions of excisional specimens also most commonly included histological descriptions and the results of ancillary studies. Out of the pathology reports of excisional specimens including microscopic descriptions 82.05% (32/39) contained a histologic description which was largely made up of dermatological (35.9% 14/39) and renal excisions (12.82% 5/39) (Figure 22.). Additionally, of the excisional specimen microscopic descriptions 41.03% (16/39) included the results of ancillary studies, mostly concentrated in dermatological, hepatic, and pulmonary excisions (10.26% each 4/39) (Figure 22.).



The comments sections of excisional specimens most frequently included histological descriptions and descriptions of consultation with other pathologists. Of the excisional specimen pathology reports with a comments section, 25.88% (22/85) included the results of a consultation, with a relatively even distribution throughout most specimen types and most commonly made up of head and neck (7.06% 6/85) and renal excisions (5.88% 5/85) (Figure 23.). Finally, 20% (17/85) of excisional specimen comments sections included a histological description, with a relatively even distribution throughout most specimen types and most commonly included for gynecological (8.24% 7/85) and head and neck excisions (3.53% 3/85) (Figure 23.).



DISCUSSION

Though previous studies have examined overall clinician comprehension of pathology reports, they have primarily focused on clinician interpretation of the clinically and prognostically relevant elements typically present in the final diagnosis section.^{6,11,16} While the implementation of mandatory standardized synoptic reports in the final diagnosis section has by

and large increased clinician satisfaction and comprehension, the role these factors play have yet to be examined and addressed in other sections of the report.^{22,23,27-30} This study appears to be the first of its kind to investigate the value, both perceived and actual of the gross and microscopic description sections of pathology reports. By determining how these sections of the report are currently utilized by both pathologists and clinicians, discrepancies in the information included by pathologists and variability in clinician comprehension may become apparent. In turn, this information may be used to develop recommendations to increase the clarity and uniformity of the entire report.

THE VALUE OF GROSS DESCRIPTIONS

The majority of pathologists reported at least “usually” reading the gross description of biopsies and “always” reading the gross description of excisional specimens yet a little over half indicated their usual method for reading consisted of glancing through and focusing on specific elements. This is unsurprising as the gross descriptions of excisional specimens typically are more detailed, lengthier, and may contain important diagnostic and staging information, whereas biopsy gross descriptions are mainly limited to tissue presence and overall dimensions.^{11,24} Despite this, the biopsy gross descriptions may play an important role in documentation as in the case of missing tissue, as well as the overall dimensions may be required to determine what proportion of tissue is occupied by neoplasm, as in the case of prostate biopsies.²⁴ Biopsy gross descriptions may also be used to guide pathologist focus, as is the case when identifying which breast biopsies include calcifications, as is our local practice.³⁸ Additionally, reading the gross description of biopsies, may provide pathologists with an indication of the adequacy of the biopsy, as has been demonstrated in fine needle aspirations, despite most of our surveyed

pathologists not selecting insufficient tissue as a common prompt for reading the gross descriptions.³⁴

Interestingly enough, pathologists appeared relatively evenly split between reading gross descriptions word by word and glancing through for specific elements as well as between the preferred format of gross descriptions, either synoptic or narrative. Though the preferred format for the gross description section has yet to be reported on in the literature, it is plausible that out of the respondents, pathologists who skim the section for specific elements may prefer synoptic templates. Gross description synoptic templates are essentially an updated, locally specific version of Raymond's paragraph system,¹³ listing out all relevant information in a point-form style and streamline the skimming process for those pathologists. Adversely pathologists who prefer to read the gross descriptions word by word presumably prefer narrative gross descriptions. Though no pathologist provided a specific rationale for preferring narrative format in gross descriptions, proponents may highlight the ability to cohesively describe specimens rationally along with the capability to alter the order and composition of information per the specific requirements of the specimen.

If pathologists did not always read the gross description the majority indicated the most common reason was that it usually did not help with the diagnostic decision-making process while unexpected findings were the most commonly selected prompt for reading it. These responses are expected since, as previously mentioned, many elements included in the gross description are largely used for documentation purposes, e.g. all tissues present, the overall size of tissues, etc. with pathologists typically able to make a diagnostic decision solely based on the information available to them when they examine microscope slides, e.g. presence and depth of invasion of neoplasms. On the other hand, if a pathologist had neglected to read or had simply

glanced through the gross description and noticed something unexpected in the microscope slide, e.g. ectopic tissue or unforeseen inflammation, they may then return to this section for a possible explanation.

Generally speaking, pathologists indicated that they thought that clinicians did not have much use for the gross description section of pathology reports with the majority responding they believed that both clinicians and patients rarely read or understood this section. Interestingly enough, more pathologists indicated that gross descriptions were rarely or never read by clinicians (78.79% 26/33) as opposed to patients (65.63% 21/32). This, however, may be explained through pathologist comments on the survey explaining that in their experience if a patient went out of their way to request a pathology report, they would be sure to read the entire report as opposed to clinicians. It is unclear however what portion of pathologists who answered this survey considered this scenario as opposed to the more frequent scenario of patients neither requesting or viewing these reports. Despite this, the majority of clinicians reported usually or always reading the gross descriptions and usually finding it comprehensible with the majority of other physicians and gynecologists answering that they always read the gross description and gynecologists and internists most commonly answering they always found the gross description comprehensible. This correlates well with the literature as Heller reported that over 94% of her surveyed clinicians, mostly gynecologists responded that they read the gross description section of pathology reports¹¹, and Powsner et al. indicating that all clinicians they quizzed correctly answered the question on gross descriptions.⁶ Though it is not inherently obvious why pathologists believe that clinicians do not utilize this section of the report, it may be that though gross descriptions are reviewed by clinicians, they mainly rely on the final diagnosis section and therefore they are rarely brought up in any subsequent conversations between clinicians and

pathologists. This conclusion would make sense as the majority of clinicians indicated they had never called a pathologist to clarify information in the gross description. In any case, clinicians, particularly medical oncologists, and gynecologists appeared to find value in reading the gross descriptions, with them indicating that they help to grasp the diagnosis and confirm pre-and intra-operative findings.

THE VALUE OF MICROSCOPIC DESCRIPTIONS

Most pathologists appeared to have a similar approach to writing microscopic descriptions with the majority of pathologists indicating that they rarely write microscopic descriptions regardless of the specimen type and felt they should rarely be included in pathology reports. The exception to this trend appeared to be cases with a challenging differential diagnosis or a certain level of diagnostic uncertainty, as most pathologists selected these scenarios as motivation to write a microscopic description. This corresponds to the practice at Powsner et al.'s institution to customarily not include a histologic description except in unusual or difficult cases.⁶ Our pathologists indicated that their most common motivations for writing microscopic descriptions include being able to communicate ancillary studies, providing additional information and explanation, and demonstrating their thought process to clinicians or other pathologists in case of a consultation/ review. Similar motivations for including microscopic descriptions have been reported in the literature and the consensus appears to be that this section is used to communicate with other pathologists and specialized clinicians conversant in pathology jargon as opposed to more generalized clinicians.^{1,14}

While a little over half of the pathologists indicated they believed clinicians usually understood microscopic descriptions, the majority answered that they believe clinicians rarely

read them. Though this may seem surprising considering that pathologists indicated they are motivated to write microscopic descriptions to provide more information for clinicians, this inconsistency may be due to various specialist pathologists catering to different groups of clinicians. For example, pathologists who specialize in non-neoplastic skin biopsies or renal biopsies may write microscopic descriptions in anticipation that the clinicians receiving this report will understand and expect this section of the report. Other pathologists whose reports may be geared towards more generalized clinicians may assume that for them this section is incomprehensible and therefore frequently skipped. Regardless, the majority of surveyed clinicians answered that they usually or always read the microscopic description section and usually understood it. Specifically, internists, oncologists, and dermatologists most frequently indicated that they always read microscopic descriptions. While no clinicians indicated they never read microscopic descriptions, radiologists and general practitioners were the two clinician groups with the highest frequency of respondents answering they rarely read them. Additionally, approximately a third of surgeons, internists, and dermatologists answered that they always understood the microscopic description. While only one general practitioner answered that they never understood the microscopic description, many radiologists and gynecologists advised that they rarely understand it. These responses correlate well with previous sources which have indicated that the greatest miscommunications in pathology reports exist when clinicians attempt to interpret histological information, suggesting that our clinicians are either more adept at deciphering pathology jargon or perhaps that they may be unaware of their limitations on this matter.^{6, 16} This second supposition may be of particular concern as clinicians not realizing they have misunderstood important therapeutic/ diagnostic information may have a more significant

impact on patient care rather than clinicians being aware of their misunderstanding and able to ask the pathologist for clarification.

In any regard, clinicians, particularly the general practitioners, internists, and medical oncologists answered that they found value in reading the microscopic description as they indicated it allowed them to understand the diagnostic decision-making process of the pathologist as well as any differential diagnoses and any ancillary studies performed. Nonetheless, clinicians still responded that they found the comments section to be of greater importance than both the gross and microscopic descriptions. Almost all of the surveyed clinicians indicated they always read this section which is a higher frequency than others have reported.¹⁰ Our clinicians, particularly the general practitioners, internists, and medical oncologists, expressed that the value of the comments section lies in listing practical information on the case, helping to understand clinicopathological correlations, and helping to understand the diagnostic decision-making process of the pathologist.

THE CURRENT CONTENT OF MICROSCOPIC DESCRIPTIONS

The pathology report review appeared to demonstrate a large discrepancy between both the presence and content of microscopic descriptions across specimen size and type. Overall comments were more commonly included in pathology reports (41.05% of cases 156/380) compared to microscopic descriptions (22.63% of cases 86/380). Microscopic descriptions were included slightly more frequently for benign biopsies (34.09% 45/132), whereas comments were included slightly more frequently in malignant tissues, whether a biopsy (52.54% 31/59) or an excisional specimen (51.45% 71/138). The reason for these discrepancies can likely be explained by pathologist survey answers. As expected, microscopic descriptions were not included in the

majority of reports which correlates with pathologists responding that they rarely write microscopic descriptions and rarely believed that they should be included. As pathologist's main motivations for writing microscopic descriptions were to outline their diagnostic decision-making process and to provide additional details and explanations to others, it suggests that they felt that benign biopsy pathology reports benefited from this additional information over malignant biopsies and excisional specimens. As biopsies are often used for diagnostic purposes the results of the final diagnosis section may have a drastic patient impact, i.e. prompting excision of the specimen in case of malignancy or adjusting/ commencing therapy in case of evidence of underlying disease. As other pathologists may review these biopsies as part of a quality control review or while examining subsequent patient biopsies/ excisions, they may feel the need to outline their thought process in case of any discrepancies. Additionally, as the final diagnosis of biopsies is frequently based on a small amount of tissue, pathologists may occasionally feel the need to use this section to justify their final diagnosis to clinicians, particularly if it is unexpected as may be the case with biopsied lesions or with complicated non-neoplastic disease processes.

On the other hand, as excisional specimens may not impact patient treatment to the same degree as biopsies do, other than in specimens with positive lymph nodes or margins, pathologists may not feel the need to supply this extra information. Additionally, oftentimes existing pathologies in excisional specimens have already been diagnosed and ancillary studies have already been performed via biopsy, making any additional histological description and test results redundant. Finally, as pathologists already have to complete the exhaustive synoptic templates for the final diagnosis section of malignant excisions which contain all the relevant

therapeutic and prognostic information, an additional microscopic description may seem excessive and unnecessary.²⁴

Comments may be included more frequently for malignant biopsies and excisional specimens for several reasons. As certain malignant biopsies are routinely reviewed by more than one pathologist, e.g. breast and some prostate biopsies, documentation of the consultation is frequently included in the comments section. Additionally, neoplasms, as opposed to benign tissues, may be subjected to additional ancillary testing the results of which are often included in this section. Finally, pathologists may use this section to convey additional information to clinicians such as information on rare diagnoses and therapeutic and prognostic information and suggestions that have yet to be incorporated into the synoptic templates.^{14,15} As benign specimens may be relatively simple to diagnose, i.e. don't require consultations or ancillary testing, the contents of the other sections of the pathology report may be sufficient to thoroughly summarize the information that the pathologist wishes to convey.

The variation in the rates of inclusion of microscopic descriptions and comments throughout specimen type for both biopsies and excisions is likely attributable to both individual pathologist preference as well as the common reasons these tissues are excised and submitted for pathological examination. For biopsies, microscopic descriptions were most often included for renal and hepatic specimens both of which were most frequently made up of histological descriptions and the results of ancillary studies. As many biopsies in these organs are performed to assess/ diagnose disease processes other than neoplasms, pathologists may feel that they benefit from additional histological information. Many renal biopsies are performed to assess for nephrotic syndrome and acute/ chronic rejection with biopsies of suspected neoplasms performed less frequently.³⁵ Since these diseases may be diagnosed by the presence of subtle histological

features and as our surveyed nephrologists stood out as one of the groups who most frequently answered they always read and found microscopic descriptions comprehensible, the understanding that nephrologists may be one of the specialized groups of clinicians who seek out and comprehend this information is supported.^{1,35} For that reason it is unsurprising that pathologists tend to include these microscopic descriptions. Though hepatic biopsies may be performed to diagnose neoplasms, frequently they are performed to evaluate other disease processes such as cirrhosis, chronic hepatitis, steatosis, and abnormal liver function tests.³⁶ Similar to renal biopsies, when reviewing hepatic biopsies for these processes, pathologists may wish to outline both relevant histological features and ancillary studies in the microscopic description to support their diagnosis.³⁶ Though the answers of surveyed hepatologists did not stand out to the same degree that those of the nephrologists did, there were few hepatologist respondents who all answered they always or usually read and understood the microscopic description. A larger number of hepatologist respondents may have allowed for a more appreciable trend and more concrete conclusions.

In addition to the microscopic description section, over half of the pathology reports of renal biopsies included a comments section. Almost all of the renal biopsy comments consisted of references to previous pathology reports, namely in renal transplant recipients receiving regular surveillance biopsies to assess for rejection.³⁵ In addition, the pathology reports of hepatic biopsies also frequently included the comments section. However, similar to the microscopic description section, the comments consisted primarily of histologic descriptions and ancillary test results. The inclusion of the same elements in different sections of hepatic biopsies may be due to pathologist preference; however, it may be inefficient for clinicians who routinely review them as they may have to search multiple sections of the report to find the desired

information. However, as almost all clinician specialties reported a high frequency of reading the comments section, information included in the comments section as opposed to the microscopic description may be of little detriment to clinicians if they would read this section regardless.

Though pulmonary biopsies are also frequently performed to assess for non-neoplastic diseases including interstitial lung diseases, granulomatous disorders, and acute/chronic rejection as well as benefiting from ancillary tests, only one pulmonary biopsy report included a microscopic description section.³⁷ The majority of pulmonary biopsies did include a comments section though, which most frequently consisted of ancillary studies, histologic descriptions, and consultations with other pathologists. This suggests that pathologists see the value in including this information in all three types of “non-neoplastic” biopsies but may include it in different sections depending on the specimen type.

Similar to pulmonary biopsies, though no breast biopsy pathology report included a microscopic description, almost half of these reports included a comments section which was largely composed of histologic descriptions and/or consultations with other pathologists. Though, unlike renal biopsies, the indication for breast biopsies is almost exclusively to diagnose neoplasms, the wide variety of breast neoplastic processes and increasing complexity of pathological examination may prompt the pathologist to include histological descriptions in the reports.³⁸ The consultations with other pathologists being frequently included in the comments section is likely because locally breast cases must be signed out by at least two pathologists and, though not required, certain pathologists refer to this in this section. Though ancillary studies are frequently performed on breast biopsies, these are not performed locally and therefore they are often issued in a second report. Interestingly enough, few dermatological biopsies included a microscopic description or comments section even though many medical biopsies may be taken

for a variety of different dermatological pathologies. However, this may be due to the overwhelming majority of dermatological biopsies taken to rule out neoplasms. That, when combined with the fact that many dermatological biopsies received by pathology departments are frequently benign, may result in the pathologists having little else to elaborate on.⁴²

Correspondingly, no prostate biopsies and few upper and lower gastrointestinal biopsy pathology reports included either microscopic descriptions or comments which may be due to the small number of indications for these biopsies. As all prostate biopsies and many gastrointestinal biopsies are performed to diagnose, and in the case of prostates grade adenocarcinomas, which often may not benefit from ancillary testing, pathologists may find it unnecessary to include any information beyond the final diagnosis section.³⁹⁻⁴¹ Though some gastrointestinal biopsies may be indicated to monitor/ diagnose relatively common chronic inflammatory and metaplastic conditions, these diseases are often suspected based on clinical symptoms, which when combined with the shortlist of differential diagnoses may lead a pathologist to deem it unnecessary to elaborate on their diagnostic decision-making process.³⁹⁻⁴¹

For the excisional specimens, microscopic descriptions were rarely included, save for dermatological excisions. As previously mentioned, microscopic descriptions may be omitted for malignant excisions due to the extensive information already included within the mandatory synoptic templates in the final diagnosis section.²⁴ However, as dermatological excisions, over half of which were malignant, only require synoptic templates for melanomas or Merkel cell carcinomas, pathologists may have used the microscopic description section to incorporate relevant histological information not included in the final diagnosis section.²⁴ Finally, as dermatologists may be one of the few groups of specialized clinicians who understand

histological descriptions, pathologists reviewing these cases may be more motivated to write microscopic descriptions.¹⁴

As the majority of excisional specimens were malignant, many specimens included comments with pulmonary, gynecological, hepatic, and renal excisions including comments the most frequently. Comments were almost always included in pulmonary excisions with differential diagnoses, ancillary studies, and consultations with other pathologists equally present. Almost all the pathology reports of gynecological excisions also included comments with histological descriptions and ancillary studies the most frequently included elements. Though this same pattern was not observed in gynecological biopsies, that may be due to a larger portion of gynecological biopsies being benign and therefore not requiring a histological description or ancillary tests. Finally, similar to biopsies, approximately half of the pathology reports for renal and hepatic excisions included comments, with consultation with another pathologist the most commonly included element for renal excisions and relevant previous pathology the most commonly included element for hepatic excisions. As our local practice is to send non-neoplastic renal parenchyma to our local genitourinary pathologists who specialize in renal pathology to assess for renal function, this finding is expected. As frequently biopsies are taken before excisions, it would make sense that relevant previous pathology would be included in the comments section of hepatic excisions, however, it fails to explain why this is not the case in the other tissues examined. Perhaps, since previous pathology reports for a patient at our institution are easily accessible in our system, certain pathologists find it redundant to include the previous pathology report number in the final pathology report of the current specimen.

Rosai et al. stated that microscopic descriptions and comments do not need to be a part of every report but rather should be added “whenever the responsible pathologist considers that

they are indicated” a sentiment that was reflected in these results.¹⁵ Compared to one previous study examining the implementation of synoptic templates, microscopic descriptions were included in 59.0% of pathology reports in 2004 and 72.7% in 2005, whereas pathology reports reviewed during our study included microscopic descriptions much less frequently, 24.6% for biopsies and 20.6% for excisions.²⁹ While part of this discrepancy may be attributed to different local practices and types of specimens received, it is possible that with repeated template use, as well as improvements in the templates themselves, pathologists may be more confident that all necessary parameters are included in the final diagnosis section and the microscopic description may be excluded.

The content of the microscopic description and comment sections more or less followed what few recommendations are present in the literature. Traditionally suggestions on the composition of the microscopic description recommend that it contain a detailed histological description of the tissue and serve to communicate with other pathologists and perhaps specialty clinicians such as those reviewing medical renal and liver biopsies and nonneoplastic skin biopsies with the comments section containing all other relevant information in non-pathology jargon.^{14,15} However, it is advised that numerous parameters such as ancillary testing may be included in both sections and the sections may be combined or omitted entirely at the discretion of the pathologist.¹⁵ Though some pathologists may appreciate the flexibility that this approach provides, if elements may be included in several different sections of the report, clinicians may have a difficult time searching for specific parameters, an issue that the implementation of synoptic reports aims to reduce.²⁸

LIMITATIONS

This study had few limitations. To start, there was a wide range of representation of different specialties in the clinician survey respondents, with certain specialties underrepresented. This makes it difficult to form accurate interpretations of the survey results, particularly when comparing responses to well-represented specialties. The nature of this type of survey is that it may be limited by the number and variety of respondents and though we grouped the answers of many specialties to make interpretations, further studies may benefit from additional respondents. Pathology survey respondents were also not questioned on their specialties. However, this issue may be somewhat mediated by separating the pathology report review results by specimen type which provides some indication of the inclinations of the pathologists generating the reports for these specimens. Additionally, contrary to the other parts of this study, the pathologists were not surveyed on their motivations and the frequency with which they write comments. This may have caused some inconsistencies as certain pathologists may have answered the microscopic description survey by describing their approach to writing the comments section. Though similar to the previous limitation, this may also have been partly rectified by separating the microscopic description and comment section contents during the pathology report review. Despite this, future studies may wish to separate these components for all sections to keep consistent and to draw the most accurate answers. In addition to this, it may be difficult to make inferences based on the term comprehensible in the clinician survey as different individuals may have their specific definitions of this term. Some clinicians may feel that a certain section is comprehensible if they have a general understanding of what the pathologist is summarizing, while others may not consider it comprehensible unless they have an intimate knowledge of all of the elements referenced in that section. Perhaps the only way to achieve an exact idea of how much clinicians comprehend is by implementing a type of quiz and

grading clinician responses. However, this would provide different results than what was examined in this study, clinicians own perceived comprehension of pathology reports. Finally, the sample size of all three parts of the study along with only surveying local pathologists and clinicians, makes it difficult to extrapolate these trends beyond our institution. Going forward, additional studies may wish to survey pathologists and clinicians and review reports from multiple institutions to achieve a greater sample size and a more accurate representation of trends in gross and microscopic descriptions. This in turn may be conducive to examining the statistical significance of these variables and allow recommendations to be made on a wider scale.

CONCLUSIONS

In conclusion, pathologists' assistants and grossing residents should be aware that pathologists usually read gross descriptions but approximately half skim over gross descriptions to look for relevant information. Using a synoptic format for this section may be desired by certain pathologists as it may increase the clarity and conciseness as long as it does not sacrifice appropriate detail. Pathologists should be aware that, though there is a range in approaches to reading and understanding the gross and microscopic descriptions based on clinician specialty, clinicians usually read, understand, and value them but that they consider the comments section the most important part of the report after the final diagnosis. Additionally, there is a wide variety of approaches to both the inclusion and content of microscopic descriptions and comments in pathology reports, when divided by specimen type, size, and final diagnosis. Increased standardization of the microscopic description and comments sections, similar to the standardization of the final diagnosis section would likely be associated with increased clinician

satisfaction and comprehension.^{29,30} Considerations for these sections are as follows. Neither section needs to be included in every pathology report and ultimately is included at the individual pathologist's discretion. The microscopic description section, if present, should contain a detailed histological description of the tissue and most likely will be included if there is a certain level of diagnostic uncertainty or if there is a difficult differential diagnosis. Comments, if present, should contain all other relevant information and should be included for documentation purposes if the information in the final diagnosis alone is insufficient for the clinician. Moving forward if the mandatory use of synoptic templates in pathology reports continues to progress perhaps microscopic descriptions and comments may be included within the synoptic templates as another optional parameter.

REFERENCES

1. Mies C. Communicating Effectively in Surgical Pathology. In: Nakhleh RE, Volmar KE, eds. Error Reduction and Prevention in Surgical Pathology. Springer International Publishing; 2019:187-198. doi:10.1007/978-3-030-18464-3_12
2. Fiscella J. Introducing patients to their pathology reports. CAP TODAY. <https://www.captodayonline.com/introducing-patients-to-their-pathology-reports-0114/> Published January 16, 2014. Accessed January 31, 2021.
3. Mossanen M, True LD, Wright JL, Vakar-Lopez F, Lavalley D, Gore JL. Surgical pathology and the patient: a systematic review evaluating the primary audience of pathology reports. *Hum Pathol*. 2014;45(11):2192-2201. doi:10.1016/j.humpath.2014.07.008
4. Strickland-Marmol LB, Muro-Cacho CA, Washington K, Foulis PR. "Ask The Pathologist": An Internet Forum Facilitating Communication Between Cancer Registrars

- and Pathologists. *Arch Pathol Lab Med*. 2018;142(10):1275-1283.
doi:10.5858/arpa.2017-0424-OA
5. Lester SC. *Manual of Surgical Pathology*. Saunders/Elsevier; 2010. Accessed January 31, 2021. <http://www.clinicalkey.com/dura/browse/bookChapter/3-s2.0-C20090388789>
 6. Powsner SM, Costa J, Homer RJ. Clinicians Are From Mars and Pathologists Are From Venus. *Arch Pathol Lab Med*. 2000;124(7):1040-1046. doi:10.5858/2000-124-1040-CAFMAP
 7. Braaf S, Manias E, Riley R. The role of documents and documentation in communication failure across the perioperative pathway. A literature review. *Int J Nurs Stud*. 2011;48(8):1024-1038. doi:10.1016/j.ijnurstu.2011.05.009
 8. Clapper TC, Ching K. Debunking the myth that the majority of medical errors are attributed to communication. *Med Educ*. 2020;54(1):74-81. doi:10.1111/medu.13821
 9. Nakhleh RE. Quality in surgical pathology communication and reporting. *Arch Pathol Lab Med*. 2011;135(11):1394-1397. doi:10.5858/arpa.2011-0192-RA
 10. Bracamonte E, Gibson BA, Klein R, Krupinski EA, Weinstein RS. Communicating Uncertainty in Surgical Pathology Reports: A Survey of Staff Physicians and Residents at an Academic Medical Center. *Acad Pathol*. 2016;3:237428951665907.
doi:10.1177/2374289516659079
 11. Heller DS. Areas of Confusion in Pathologist-Clinician Communication as it Relates to Understanding the Vulvar Pathology Report. *J Low Genit Tract Dis*. 2017;21(4):327-328.
doi:10.1097/LGT.0000000000000350
 12. Valenstein P. Formatting pathology reports: applying four design principles to improve communication and patient safety. *Arch Pathol Lab Med*. 2008;132(1):84.

13. Dayton A, Ro J, Schwartz M, Ayala A, Raymond K. Raymond's Paragraph System: an alternative format for the organization of gross pathology reports and its implementation in an academic teaching hospital. *Arch Pathol Lab Med*. 2009;133(2):298.
14. Smith SM, Yearsley M. Constructing Comments in a Pathology Report: Advice for the Pathology Resident. *Arch Pathol Lab Med*. 2016;140(10):1023-1024.
doi:10.5858/arpa.2016-0220-ED
15. Association of Directors of Anatomic and Surgical Pathology. Standardization of the Surgical Pathology Report. *Am J Surg Pathol*. 1992;16(1):84-86. doi:10.1097/00000478-199201000-00013
16. Zare-Mirzaie A, Hassanabadi HS, Kazeminezhad B. Knowledge of Medical Students about Pathological Reports. *J Med Educ (Tehran)*. 2017;16(1):26-34.
doi:10.22037/jme.v16i1.16452.
17. Ruby SG. Clinician interpretation of pathology reports. *Arch Pathol Lab Med*. 2000;124(7):943-944. doi:10.5858/2000-124-0943-CIOPR
18. Stevenson MK, Carter MD, Bethune GC. UTILIZATION AND EVALUATION OF SURGICAL PATHOLOGY REPORTS BY FAMILY PHYSICIANS: A Post-Analytical Quality Assurance Study. *Can J of Pathol*. 2016;8(3):62-76.
19. Improving pathologists' communication skills. *AMA J Ethics*. 2016;18(8):802-808.
doi:10.1001/journalofethics.2016.18.8.medu1-1608
20. Raab SS, Nakhleh RE, Ruby SG. Patient safety in anatomic pathology: measuring discrepancy frequencies and causes. *Arch Pathol Lab Med*. 2005;129(4):459-466.
doi:10.5858/2005-129-459-PSIAPM

21. Hollensead SC, Lockwood WB, Elin RJ. Errors in pathology and laboratory medicine: Consequences and prevention. *J Surg Oncol*. 2004;88(3):161-181. doi:10.1002/jso.20125
22. Paxton A. Cancer protocols: leaner, later, more lenient.
http://www.captodayonline.com/Archives/feature_stories/0604Cancer_Protocols.html
Published June 2004. Accessed February 12, 2021.
23. Cancer Care Manitoba. Manitoba Cancer System Performance Report.
<https://www.cancercare.mb.ca/export/sites/default/About-Us/.galleries/files/corporate-publications/System-Performance-Report.pdf> Published 2019. Accessed February 12, 2021.
24. Cancer Protocols. College of American Pathologists. <https://www.cap.org/protocols-and-guidelines/cancer-reporting-tools/cancer-protocols> Accessed February 12, 2021.
25. Schroeck FR, Pattison EA, Denhalter DW, et al. Early stage bladder cancer: do pathology reports tell us what we need to know? *Urology*. 2016;98:58-63.
doi:10.1016/j.urology.2016.07.040
26. Idowu MO, Bekeris LG, Raab S, Ruby SG, Nakhleh RE. Adequacy of surgical pathology reporting of cancer: a college of american pathologists q-probes study of 86 institutions. *Yearb Pathol Lab Med*. 2011;2011:7-8. doi:10.1016/S1077-9108(10)79519-0
27. Sluijter CE, van Lonkhuijzen LRCW, van Slooten H-J, Nagtegaal ID, Overbeek LIH. The effects of implementing synoptic pathology reporting in cancer diagnosis: a systematic review. *Virchows Arch*. 2016;468(6):639-649. doi:10.1007/s00428-016-1935-8
28. Srigley JR, McGowan T, MacLean A, et al. Standardized synoptic cancer pathology reporting: A population-based approach. *J Surg Oncol*. 2009;99(8):517-524.
doi:10.1002/jso.21282

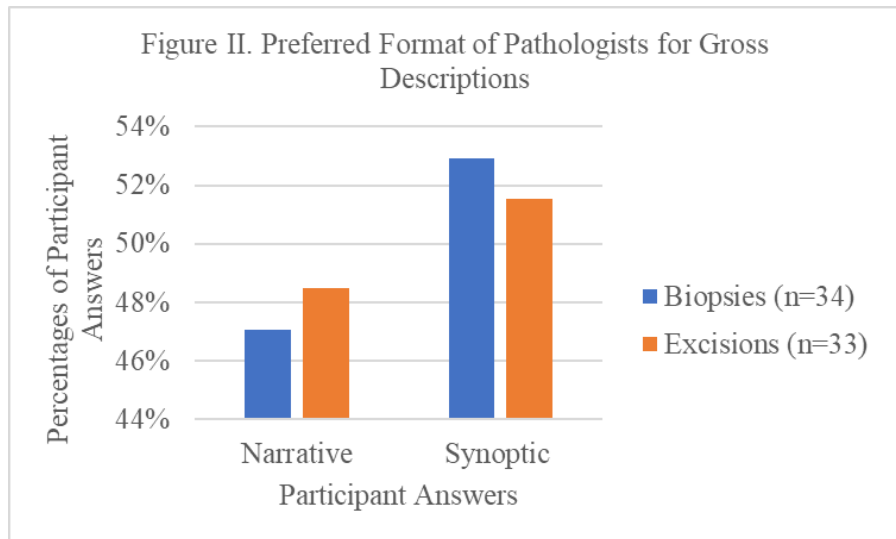
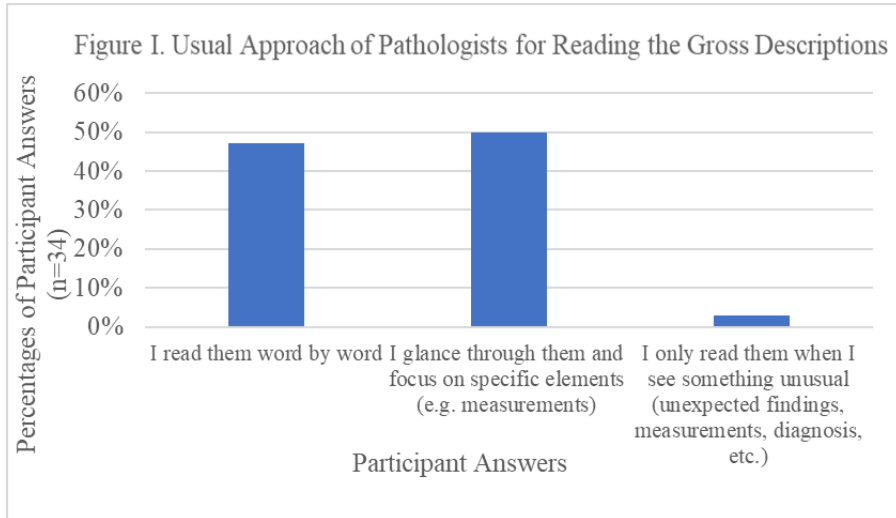
29. Nakhleh RE, Souers R, Ruby SG. Physician satisfaction with surgical pathology reports: a 2-year college of american pathologists q-tracks study. *Arch Pathol Lab Med*. 2008;132(11):1719-1722. doi:10.5858/132.11.1719
30. Lankshear S, Srigley J, McGowan T, Yurcan M, Sawka C. Standardized synoptic cancer pathology reports — so what and who cares? A population-based satisfaction survey of 970 pathologists, surgeons, and oncologists. *Arch Pathol Lab Med*. 2013;137(11):1599-1602. doi:10.5858/arpa.2012-0656-OA
31. Ryan MS, Smith ML, Grzybicki DM, Raab SS. Resident education and quality of gross tissue examination practices of benign uteri. *J Clin Pathol*. 2011;64(9):761-764. doi:10.1136/jclinpath-2011-200116
32. Leong AS-Y, Visinoni F, Visinoni C, Milios J. An advanced digital image-capture computer system for gross specimens: a substitute for gross description. *Pathology*. 2000;32(2):131-135. doi:10.1080/003130200104385
33. Horn CL, DeKoning L, Klonowski P, Naugler C. Current usage and future trends in gross digital photography in Canada. *BMC Med Educ*. 2014;14(1):11. doi:10.1186/1472-6920-14-11
34. Mayall F, Cormack A, Slater S, McAnulty K. The utility of assessing the gross appearances of FNA specimens: The utility of assessing the gross appearances of FNA specimens. *Cytopathology*. 2010;21(6):395-397. doi:10.1111/j.1365-2303.2009.00733.x
35. Howie AJ. Chapter 2 General Points About Renal Biopsy Specimen. In: Howie AJ, ed. *Handbook of Renal Biopsy Pathology*. 2nd edition. Springer, New York, NY; 2008: 5-9. Accessed May 25, 2021. <https://doi-org.uml.idm.oclc.org/10.1007/978-0-387-74605-0>

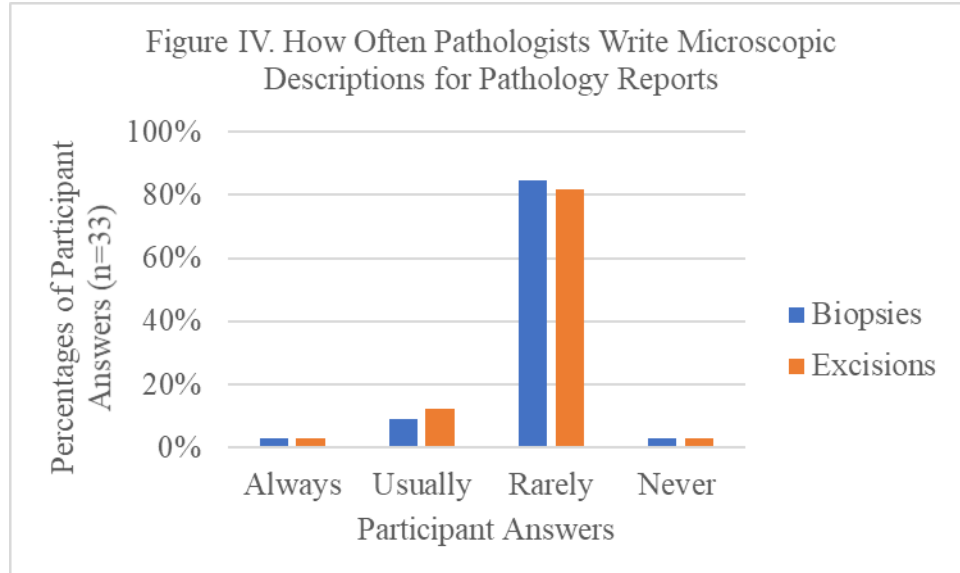
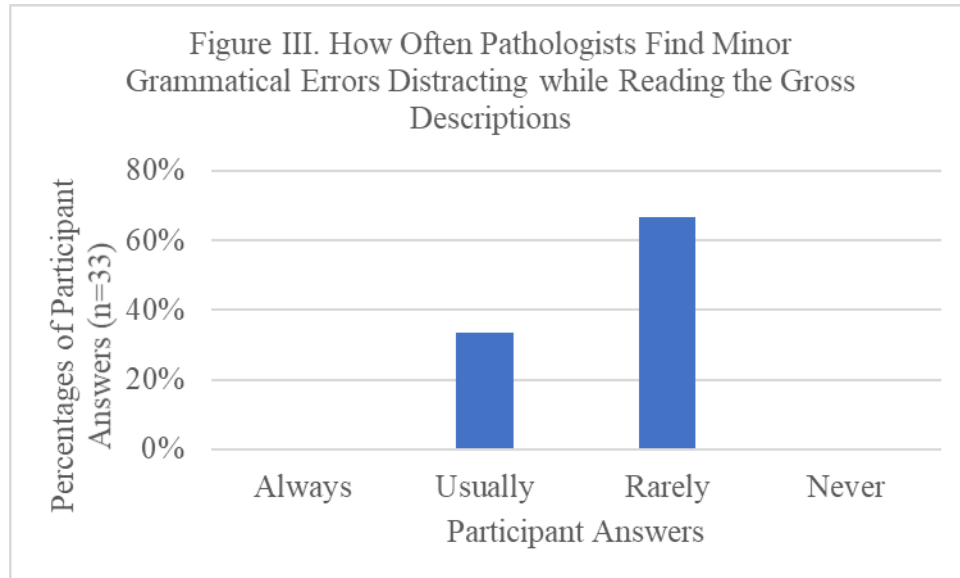
36. Lefkowitz JH, Scheuer PJ. General Principles of Biopsy Assessment. In: Lefkowitz JH, ed. *Scheuer's Liver Biopsy Interpretation*. 10th edition. Elsevier, Philadelphia, PA; 2021: 1-12. Accessed May 25, 2021. <https://www.clinicalkey.com/dura/browse/bookChapter/3-s2.0-C20170002410>
37. Gal AA, Farver CF. The Uses and Abuses of the Lung Biopsy. In: Zander DS, Farver CF, eds. *Pulmonary Pathology*. 2nd edition. Elsevier, Philadelphia, PA; 2018: 8-13. Accessed May 25, 2021. <https://www.clinicalkey.com/#!/content/book/3-s2.0-B9780323393089120011>
38. Denison CM, Lester SC. The Core Needle Biopsy Program: Essential Components of a Successful Breast Core Needle Biopsy Program: Imaging Modalities, Sampling Techniques, Specimen Processing, Radiologic/ Pathologic Correlation, and Appropriate Follow-Up. In: Shin SJ, ed. *A Comprehensive Guide to Core Needle Biopsies of the Breast*. Springer, New York, NY; 2016: 3-47. Accessed May 25, 2021. https://doi-org.uml.idm.oclc.org/10.1007/978-3-319-26291-8_1
39. Sakr W. Defining the Problem: From Subclinical Disease to Clinically Insignificant Prostate Cancer. In: Jones JS, ed. *Prostate Biopsy Indications, Techniques, and Complications*. Humana Press; 2008: 1-13. Accessed May 25, 2021. doi:10.1007/978-1-60327-078-6
40. Bateman, AC, Patel, P. Lower Gastrointestinal Endoscopy: Guidance on Indications for Biopsy. *Frontline Gastroenterol* 2013; 5(2): 96–102, doi:10.1136/flgastro-2013-100412
41. Loughrey, Maurice B., and Neil A. Shepherd. “The Indications for Biopsy in Routine Upper Gastrointestinal Endoscopy.” *Histopathology*, vol. 78, no. 1, Wiley Subscription Services, Inc, 2021, pp. 215–27, doi:10.1111/his.14213

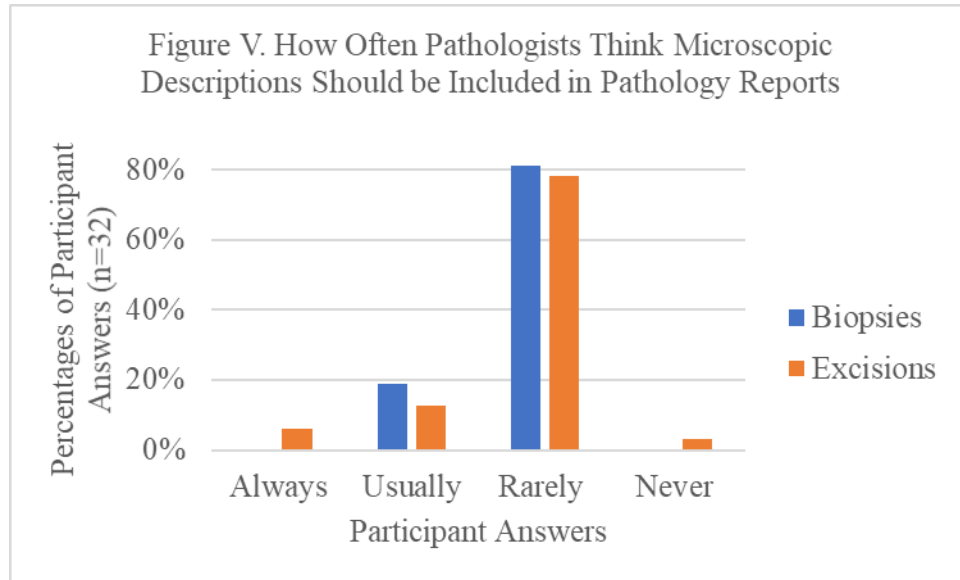
42. Theiler M, Neuhaus K, Kerl K, Weibel L. The Spectrum of Skin Biopsies and Excisions in a Pediatric Skin Center. *Eur J Pediatr.* 2017;176(12):1663-1668. doi:10.1007/s00431-017-3021-x

APPENDIX A.

GRAPHS







QUESTIONNAIRE FOR PATHOLOGISTS ON GROSS DESCRIPTIONS IN PATHOLOGY REPORTS

Question 1: What is your usual approach to reading the gross description of a biopsy?

Answer 1:

- Always
- Usually
- Rarely
- Never

Question 2: What is your usual approach to reading the gross description of an excisional specimen (e.g. skin ellipse, lung wedge)?

Answer 2:

- Always
- Usually
- Rarely
- Never

Question 3: When you read the gross description what is your usual method?

Answer 3:

- I read them word by word
- I glance through them and focus on specific elements (e.g. measurements)
- I only read them when I see something unusual (unexpected findings, measurements, diagnosis, etc.)

Question 4: What format would you prefer for the gross descriptions of the small biopsies?

Answer 4:

- Narrative
- Synoptic

Question 5: What format would you prefer for the gross descriptions of the excisional specimens?

Answer 5:

- Narrative
- Synoptic

Question 6: If you don't always read the gross descriptions, what is the reason?

Answer 6:

- Time constraints
- Length of descriptions
- Usually does not help the diagnostic decision-making progress
- Not applicable

Question 7: If you don't always read the gross descriptions, what triggers you to read them?

Answer 7:

- Unexpected findings
- Insufficient tissue
- Unable to make a diagnosis
- Not applicable

Question 8: How often do you find minor grammatical errors distracting while reading the gross description?

Answer 8:

- Always
- Usually
- Rarely
- Never

Question 9: How often do you think clinicians read gross descriptions in pathology reports?

Answer 9:

- Always
- Usually
- Rarely
- Never

Question 10: How often do you think clinicians understand the gross descriptions in pathology reports?

Answer 10:

- Always
- Usually
- Rarely
- Never

Question 11: How often do you think patients read the gross descriptions in pathology reports?

Answer 11:

- Always

- Usually
- Rarely
- Never

Question 12: How often do you think patients understand the gross descriptions in pathology reports?

Answer 12:

- Always
- Usually
- Rarely
- Never

Question 13: How often do you think clinicians would better understand the diagnosis by reading the gross descriptions in pathology reports?

Answer 13:

- Always
- Usually
- Rarely
- Never

Question 14: How often do you think clinicians would be able to better convey the diagnosis to the patient by reading the gross descriptions in pathology reports?

Answer 14:

- Always
- Usually
- Rarely
- Never

Question 15: If a clinician disagreed with a final diagnosis, how often do you think reading the gross description in pathology reports would give them grounds to reconsider?

Answer 15:

- Always
- Usually
- Rarely
- Never

Question 16: If you have any additional comments please type them here (optional):

QUESTIONNAIRE FOR PATHOLOGISTS ON MICROSCOPIC DESCRIPTIONS IN PATHOLOGY REPORTS

Question 1: How often do you write microscopic descriptions for biopsies in pathology reports?

Answer 1:

- Always
- Usually
- Rarely
- Never

Question 2: How often do you think pathologists should include microscopic descriptions for biopsies in pathology reports?

Answer 2:

- Always
- Usually
- Rarely
- Never

Question 3: How often do you write microscopic descriptions for large excisions in pathology reports?

Answer 3:

- Always
- Usually
- Rarely
- Never

Question 4: How often do you think pathologists should include microscopic descriptions in pathology reports for large excisions?

Answer 4:

- Always
- Usually
- Rarely
- Never

Question 5: In which of these scenarios would you include microscopic descriptions in pathology reports?

Answer 5:

- Simple cases

- Cases with a challenging differential diagnosis
- Cases you were asked to review
- Cases with a certain level of diagnostic uncertainty
- Cases requiring consultation with another pathologist

Question 6: What motivates you to write a microscopic description?

Answer 6:

- It is an essential element of the report, I always write one
- To demonstrate my thought process should another pathologist review my case
- To provide additional information and explanation for the clinicians
- To provide additional information and explanation for the patients
- To provide additional information and explanation for a colleague in case of a consultation
- If there is a relevant previous pathology with a different diagnosis
- In order to communicate ancillary studies

Question 7: How often do you think clinicians read the microscopic descriptions in pathology reports?

Answer 7:

- Always
- Usually
- Rarely
- Never

Question 8: How often do you think clinicians understand the microscopic descriptions in pathology reports?

Answer 8:

- Always
- Usually
- Rarely
- Never

Question 9: How often do you think clinicians would better understand the diagnosis by reading the microscopic descriptions in pathology reports?

Answer 9:

- Always
- Usually
- Rarely

- Never

Question 10: How often do you think clinicians would be able to better convey the diagnosis to the patient by reading the microscopic descriptions in pathology reports?

Answer 10:

- Always
- Usually
- Rarely
- Never

Question 11: If a clinician received an unexpected pathology diagnosis, how often do you think reading the microscopic description will help them to understand the diagnosis?

Answer 11:

- Always
- Usually
- Rarely
- Never

Question 12: If you have any additional comments please type them here (optional).

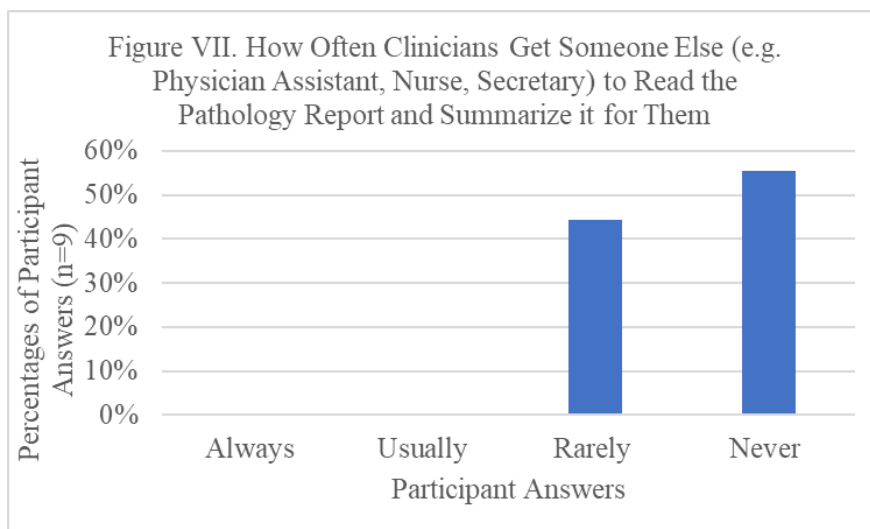
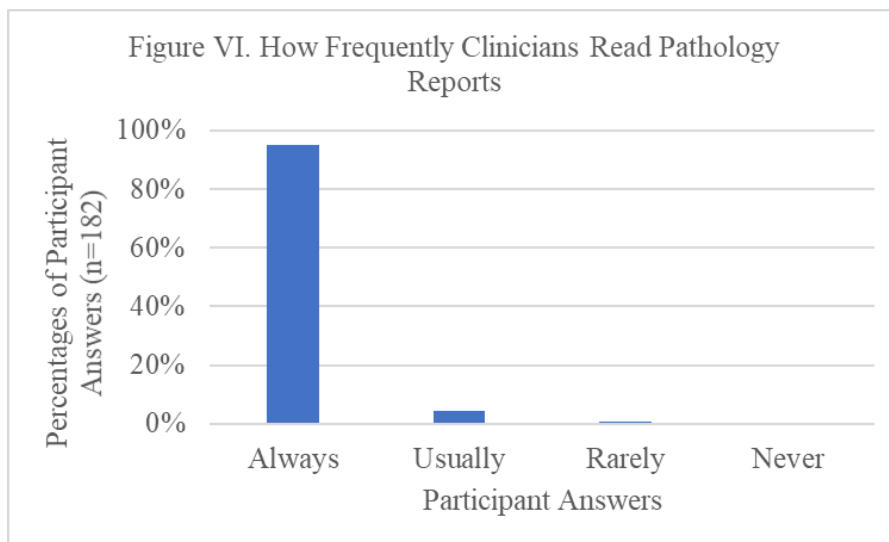
APPENDIX B

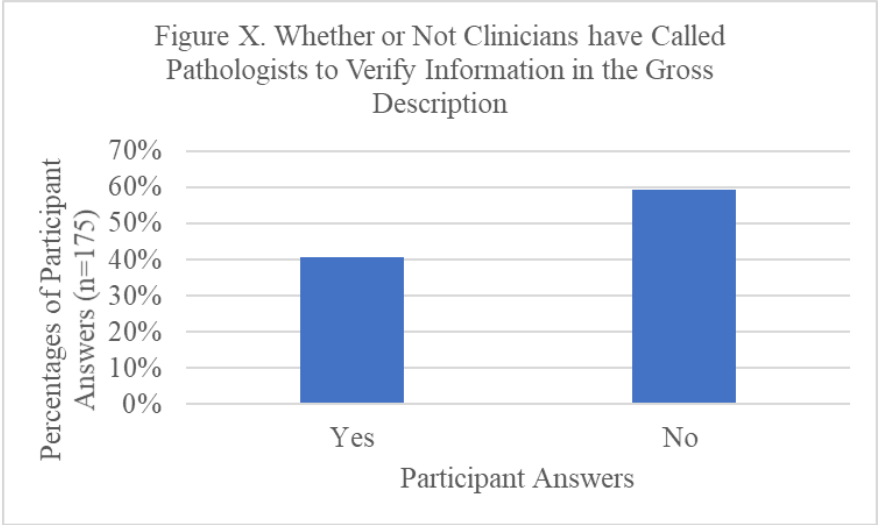
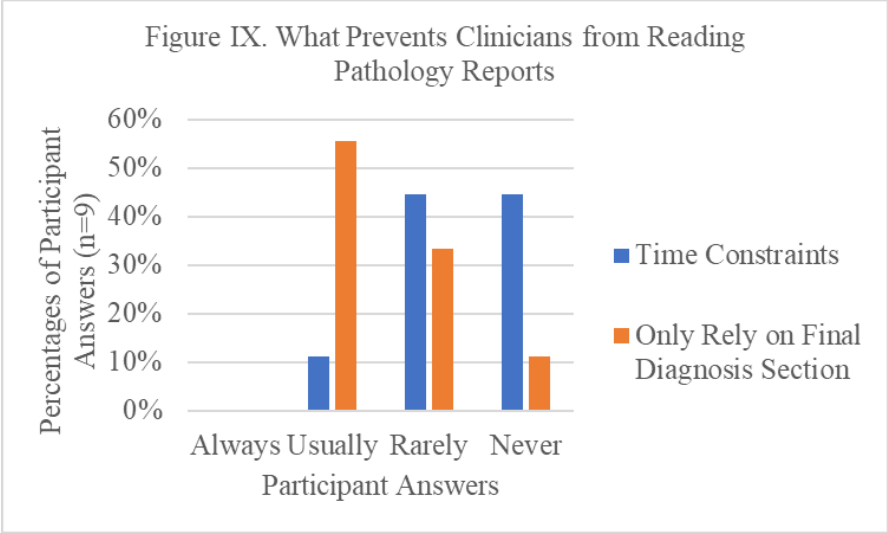
TABLE

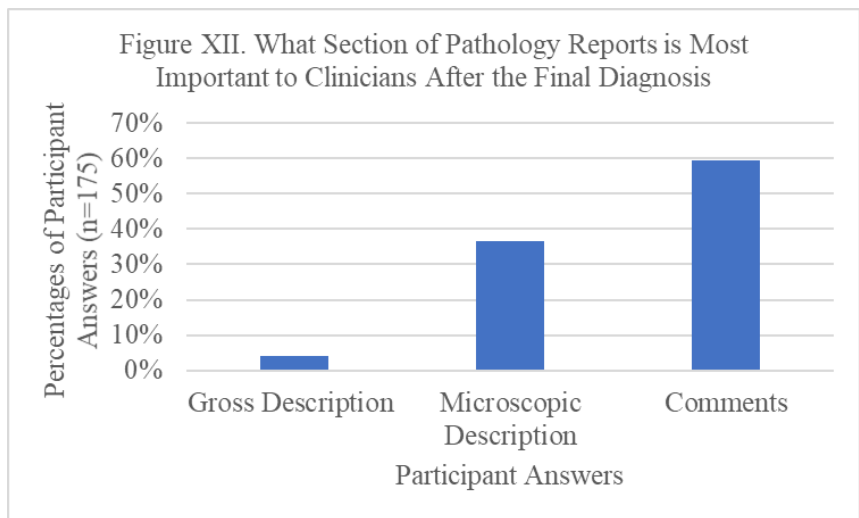
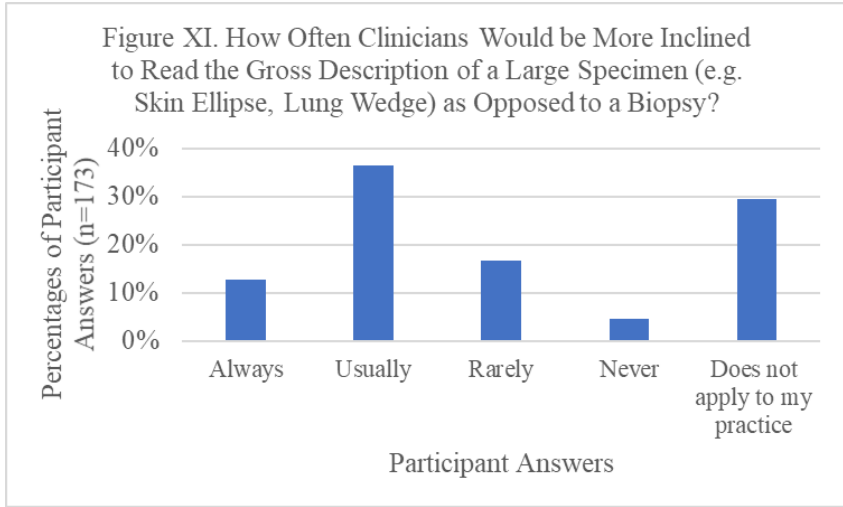
| Table i. Clinician Respondents' Specialties and Groupings | |
|--|-----------------------------|
| Type of Clinicians | Number of Clinicians |
| Dermatology | 8 |
| General Practitioner (total): | 71 |
| Family Medicine | 1 |
| General Practitioner | 70 |
| Gynecology | 3 |
| Internal Medicine (total): | 43 |
| Cardiology | 1 |
| Critical Care | 2 |
| Endocrinology | 4 |
| Gastroenterology | 3 |
| General Internal Medicine | 10 |
| Geriatric Medicine | 2 |
| Hematology | 2 |
| Hepatology | 4 |
| Infectious Diseases | 2 |
| Nephrology | 8 |
| Pulmonology | 3 |
| Rheumatology | 2 |
| Medical Oncology (total): | 32 |

| | |
|---------------------------------|----|
| General Oncology | 27 |
| Gynecologic Oncology | 2 |
| Hematooncology | 1 |
| Pediatric Oncology | 1 |
| Urologic Oncology | 1 |
| Other (total): | 7 |
| Anesthesiology | 2 |
| Clinical Immunology and Allergy | 1 |
| Emergency Medicine | 1 |
| Midwifery | 1 |
| Physiatry | 1 |
| Pathology | 1 |
| Radiology | 8 |
| Surgeons (total): | 13 |
| General Surgeons | 8 |
| Head and Neck Surgeons | 2 |
| Orthopedic Surgeons | 3 |

GRAPHS







QUESTIONNAIRE FOR CLINICIANS ON PATHOLOGY REPORTS

Question 1: What is the best description of your medical practice?

Answer 1:

- General Practitioner (go to question 3)
- Specialist (go to question 2)

Question 2: What type of specialty do you practice?

Answer 2:

- Family Medicine
- Dermatology
- Gastroenterology
- Hepatology
- Thoracic Surgery
- Surgery
- Head and Neck Surgery
- Breast Surgery
- Radiology
- Pulmonology
- Gynecology
- Oncology
- Other (please specify) _____

Question 3: When you receive a pathology report how often do you read the report yourself?

Answer 3:

- Always (go to question 7)
- Usually (go to question 4)
- Rarely (go to question 4)
- Never (go to question 4)

Question 4: How often do you get someone else (e.g. Physician Assistant, Nurse, Secretary) to read the pathology report and summarize it for you?

Answer 4:

- Always
- Usually
- Rarely
- Never

Question 5: How often are you unable to read the pathology report due to time constraints?

Answer 5:

- Always
- Usually
- Rarely
- Never

Question 6: How often do you not read the whole report because you only rely on the final diagnosis section?

Answer 6:

- Always
- Usually
- Rarely
- Never

Question 7: Pathology reports have 4 major potential parts (final diagnosis in all cases, gross descriptions to describe the specimens in all cases, sometimes microscopic descriptions to explain histologic findings, and comments to address clinicopathologic correlations). How often do you read the gross description section?

Answer 7:

- Always
- Usually
- Rarely
- Never

Question 8: When you read the gross description in a pathology report, how often do you find it comprehensible?

Answer 8:

- Always
- Usually
- Rarely
- Never

Question 9: What do you find is the value of reading the gross description in a pathology report (pick all applicable)?

Answer 9:

- Helps to confirm preoperative and intraoperative findings
- Helps to grasp the diagnosis

- Helps to convey the diagnosis to the patient
- Gross descriptions are mostly helpful for pathologists, not for clinicians
- Gross descriptions are used for documentation, do not add value for clinical decisions

Question 10: Have you ever called a pathologist to clarify the information listed in the gross description?

- Yes
- No

Question 11: How often would you be more inclined to read the gross description of a large specimen (e.g. skin ellipse, lung wedge) as opposed to a biopsy?

Answer 11:

- Always
- Usually
- Rarely
- Never
- Does not apply to my practice

Question 12: When you read a pathology report, how often do you read the microscopic description section?

Answer 12:

- Always (go to question 13)
- Usually (go to question 13)
- Rarely (go to question 13)
- Never (go to question 14)

Question 13: How often do you find the microscopic description comprehensible?

Answer 13:

- Always
- Usually
- Rarely
- Never

Question 14: What do you find is the value of reading the microscopic description in a pathology report (pick all applicable)?

Answer 14:

- Helps to understand the diagnostic decision making of the pathologist
- Helps to understand the differential diagnosis
- Helps to convey the diagnosis to the patient

- Ancillary studies (immunohistochemistry, molecular) are listed here
- The pathology language and the terminology of the microscopic descriptions are difficult to follow
- Microscopic descriptions are not helpful for clinicians
- Microscopic descriptions are used for documentation, do not add value for clinicians

Question 15. How often do you read comments in the pathology reports?

Answer 15:

- Always
- Usually
- Rarely
- Never

Question 16. What do you find is the value of reading the comments in a pathology report (pick all applicable)?

Answer 16:

- Lists practical information on the case
- Helps to understand the diagnostic decision making of the pathologist
- Helps to understand the clinicopathologic correlations
- Doesn't add much value for clinicians

Question 17. In your practice what is the most important part of the pathology report after the final diagnosis?

Answer 17:

- Gross description
- Microscopic description
- Comment

APPENDIX C

GRAPHS

