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Evaluation of Washington State Department of Health Prenatal Genetics Resources

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**Abstract**

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**Background:** Prenatal care is one of the most utilized healthcare services in the United States (Osterman & Martin, 2018). Genetic screening and carrier screening are both an important aspect of prenatal care. A Prenatal Genetics Task Force, comprising experts from varied disciplines, was convened by the Washington State Department of Health (WA DOH) to address a recent Washington Administrative Code update (WAC Chapter 246.680), rapid uptake in prenatal screening tests, direct-to-consumer tests being marketed as gender reveal tests, and prenatal genetic tests happening in non-genetic clinical settings. This study aimed to evaluate two provider resources published by the task force on prenatal genetic screening and carrier screening and obtain feedback to determine if the resources met provider needs and increased provider confidence to order tests and interpret results for these topics.

**Methods:** An online survey was created, and IRB approval was received. The survey was then uploaded to Survey Monkey and sent to providers via email by members of the Prenatal Genetics Task Force. The survey was open for three weeks. Qualitative responses were coded utilizing both deductive and inductive coding. Quantitative analysis included a Wilcoxon signed rank test,

performed on questions pertaining to provider confidence in ordering and interpreting both carrier screening and prenatal genetic screening tests, before and after reviewing the Department of Health resources.

**Results:** The survey gathered 37 responses. Three themes were unveiled through the coding process that easily summarize the results of this survey. For the carrier screening landing pages and fact sheets, the biggest feedback we received was the need for these resources to be translated into more languages, cost and insurance estimates to be added, and these resources were too much information for a busy provider to review when in a rush. For prenatal genetic screening, we found the most important feedback to be on cost/insurance estimates, more consideration around maternal age and what tests would be best to order for older women, and that these resources are expecting too much from providers. In our quantitative comparisons, we determined that there was a difference detected before and after reviewing the resources for ordering carrier screening tests and interpreting prenatal genetic screening results.

**Discussion:** According to our Wilcoxon signed rank tests, there was a confidence increase in ordering carrier screening tests and interpreting prenatal genetic screening results, before and after exploring the Department of Health resources. There was no change in confidence between the carrier screening resources and the prenatal genetic screening resources, leading us to believe both resources are performing well. There are both strengths and limitations to this work.

**Conclusion:** The survey results confirmed that the resources created are helpful, full of necessary and correct information, and can help increase confidence in non-genetic providers who order genetic testing for their prenatal and preconception patients.

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## **Background:**

Prenatal care is one of the most utilized healthcare services in the United States (Osterman & Martin, 2018). Prenatal care is defined as monitoring the development of the fetus and following up on care for both the fetus' and mother's health (Hajizadeh et al., 2016). In the US, there are around 3 million births a year and the birth rate is 11 per 1,000 population for the year 2022 (Osterman et al., 2024). Out of these births, only 41% of all pregnant women received adequate prenatal care between 2019 and 2021 (Martin & Osterman, 2023).

Prenatal care is often considered synonymous with ultrasounds or pregnant individuals seeking vitamins or advice early on in pregnancy. However, this is not its full scope. Prenatal care is the care the pregnant individual seeks throughout their whole pregnancy. It aims to achieve three key goals:

1. screen for and manage any chronic medical conditions or pregnancy complications,
2. prepare for the course of pregnancy, birth, postpartum, and even parenting, and
3. manage mental health conditions or any non-medical factors (Peahl et al., 2023).

Prenatal care involves monthly, biweekly, and weekly visits to a healthcare provider that become more frequent the closer the due date becomes (Peahl & Howell, 2021). This equates to approximately 12-14 visits over the course of a pregnancy.

The timing of when women start their prenatal care is also an important factor in the women's and child's health. It has been observed that when individuals seek care in the first trimester of pregnancy (the first 12 weeks), the opportunity for early detection and treatment of life-threatening conditions is optimized and interventions such as screening, education, and support reduce adverse outcomes during birth (Docherty & Johnston, 2015).

Genetic screening is defined as assessing people who are not presenting symptoms to identify genetic susceptibility to diseases or risk of disease with the goal of improving health outcomes (Burke et al., 2011). Screening for pregnancy should be able to pinpoint common or significant fetal disorders/anomalies and guarantee that women with unaffected pregnancies are truly unaffected (Krstić & Običan, 2019). It is an essential part of prenatal care and has evolved rapidly over the past couple of decades (Dukhovny & Norton, 2018). Prenatal genetic screening can help in reproductive decision-making and help to establish whether there is an increased risk of a genetic anomaly (Burke et al., 2011). Genetic screening can also help define at-risk patients (Krstić & Običan, 2019).

Prenatal screening typically occurs within a clinical setting as part of obstetric care but doesn't always include consulting genetic experts (Burke et al., 2011). It can come in the form of blood tests, ultrasounds, cell-free blood screening, and genetic testing of the fetus (Allyse & Michie, 2022). Blood tests are also called serum screening because once the blood is drawn it is clotted and separated into serum and red blood cells. Serum screenings are done at 10 weeks and then again between 14 and 20 weeks (Better Health Channel, 2022) and are customary for all pregnant women regardless of their risk category (Jelin et al., 2019). Detection of neural tube defects was one of the earliest screenings available and was done by evaluating high levels of a protein called alpha-fetoprotein found in maternal serum (Jelin et al., 2019). Ultrasounds are often the first type of screening for pregnancies. Ultrasounds can help detect structural abnormalities and visualize anatomy and can also be used alongside other tests to help confirm certain diagnoses. Cell-free DNA (cfDNA) is a relatively new development in the changing landscape of prenatal genetic testing. It is usually a result of cell death and consists of small fragments of placental DNA not contained within a cell that circulates in the mother's blood. It is

almost indistinguishable from fetal DNA and can be assessed for genetic disorders in the fetus (Krstić & Običan, 2019). Recently, the number of conditions that cfDNA can test for has expanded and includes assessment of “fetal sex and sex chromosomal aneuploidies (Bianchi & Chiu, 2018).” Serum screening and cfDNA are both noninvasive ways of genetic screening. Lastly, diagnostic screening can come in many forms but the most popular are karyotyping, Next Generation Sequencing (NGS), and whole exome sequencing. Diagnostic tests take samples directly from the fetus through the placenta or fetal fluid (Jelin et al., 2019). These tests are more commonly searching for underlying genetic conditions, such as chromosomal abnormalities.

Carrier screening is another important aspect of prenatal care. This screening is done on parents to determine which couples carry the same recessive genetic conditions since carrier status is usually unknown (Krstić & Običan, 2019). It informs them of their chances of passing this recessive genetic condition on to their offspring (Kraft et al., 2018). In its infancy, carrier screening was mostly recommended for people of certain ethnic groups that were most likely to benefit from these services and for only specific diseases (Kraft et al., 2018). Since then, carrier screening has been expanded to include hundreds of conditions but is still a fairly new concept to some providers (Kraft et al., 2018). Carrier screening can be an important part of family planning, especially for people who are carriers of certain diseases and do not have symptoms themselves.

Prenatal care, carrier screening, and prenatal genetic testing are an important aspect of public health in the maternal and child health realm. Prenatal care lays out fundamental details to better healthcare for not just the pregnant individual, but for the infant and whole family as well (United States Public Health Service Expert Panel on the Content of Prenatal Care, 1989). Most known genetic conditions cause abnormalities after the child is born, but many can be detected

while the baby is still developing in the womb (United States Public Health Service Expert Panel on the Content of Prenatal Care, 1989). Some of the benefits of normalizing prenatal genetic screening/testing are preventing death, giving mothers/families more options to consider, and an opportunity for preparation of a special needs child before the birth of the baby. Patients also benefit and tend to be more empowered when they are made aware of the options available to them (Stortz et al., 2010). One study showed that when patients were properly educated on their choices there was lower decisional conflict and decisional regret (Stortz et al., 2010).

The Washington Administrative Code (WAC) Chapter 246.680 serves to “establish standards for screening and diagnostic procedures for prenatal diagnosis of congenital disorders of the fetus and to establish criteria and timelines regarding the availability and use of prenatal tests for healthcare providers to share with pregnant women and couples (Washington State Legislature, 2023).” In 2021, this code was updated to require insurance providers to cover prenatal cfDNA screening and carrier screening for a panel of 14 genetic conditions. This along with the rapid uptake in prenatal screening tests, direct-to-consumer tests marketed as gender reveal tests, and the fact that many prenatal genetic screening tests are now happening in a setting with no genetic guidance, prompted the Genetics Program at the Washington State Department of Health to convene the Prenatal Genetics Task Force. The Prenatal Genetics Task Force was comprised of subject matter experts including physicians, family medicine specialists, OB-GYN’s, genetic counselors, nurses, and public health professionals who all felt strongly about this cause and wanted to help create a standard of care for prenatal patients in Washington.

The goal of the task force was to review the current guidelines and best practices for prenatal genetic testing and create evidence-based recommendations and tools to guide Washington State healthcare providers on a range of prenatal genetic tests that can be offered to their patients. This

included which tests to offer, when to offer them, and criteria for follow-up care. These resources addressed an unmet need in provider knowledge to provide quick access to comprehensive resources.

These resources were made available in December of 2023 on the Washington State Department of Health website as three landing pages: two provider-centered and one patient-focused. The provider-centered landing pages are guides for providers who are ordering prenatal genetic screening/testing ([Prenatal Genetic Screening for Providers | Washington State Department of Health](#)) or carrier screening ([Carrier Screening | Washington State Department of Health](#)). The patient-focused landing page ([Prenatal Genetic Screening for Patients | Washington State Department of Health](#)) is a resource for patients to better understand these tests. This thesis focused on only the provider-centered landing pages and evaluated them on content, ease of use, and accessibility. Links to the web pages have been embedded in the text and images of the landing pages can be found in **Appendix A**.

These landing pages and fact sheets act as a guide for providers who do not have detailed knowledge of genetics since this is a gap in knowledge and a known barrier in the realm of prenatal genetic testing (Jelin & Vora, 2018). Clinical guidelines are explained as “recommendations for clinicians about the care of patients with specific conditions... based upon the best available research evidence and practice expertise (Shekelle, 2022).” These guidelines are important to aid nongenetic specialists in ordering and interpreting genetic results; especially since there are few genetic specialists in the workforce who are available to help with interpretation (Sebastian et al., 2021). The majority of orders for prenatal genetic screening and testing come from primary care or other settings where the attending physician does not have expertise in genetics. This can lead to wrong tests being ordered, misunderstanding of the results

being reported, and poor counseling or coordination of care (Feldman et al., 2023). The landing pages will hopefully be one solution to help manage the number of tests available to order (including those in the WAC update) and help prevent needless or hurtful interventions from happening (Sebastian et al., 2021).

The research questions guiding this survey were:

1. Does providing online genetic resources to providers without genetic expertise increase their confidence and ability to order and interpret genetic test results for prenatal patients?
2. After reviewing online resources, is there anything missing to make it more impactful?

Since prenatal genetic screening has been around for much longer than carrier screening and providers are comfortable with ordering prenatal genetic screening tests, we expect providers to get more use from the available resources on interpreting prenatal genetic screening results. On the other hand, since carrier screening and expanded carrier screening are newer concepts, we expect providers to find the resources on ordering carrier screening tests more useful. For comparing the carrier screening and prenatal genetic screening resources to each other, we don't expect to see a difference in confidence because we want these resources to perform equally.

To help reach our research goals, we used the Theory of Planned Behavior to guide our approach. The Theory of Planned Behavior explores relationships between someone's behavior and their intentions, beliefs, and attitudes (National Cancer Institute, 2005). The idea is that intention is an important deciding factor in determining someone's behavior (National Cancer Institute, 2005). Behavioral intention is influenced by one's attitude toward doing the action, the beliefs they (and others important to them) hold, and one's belief that they can control behaviors

(National Cancer Institute, 2005). **Figure 1** shows a schematic diagram of the theory. We used the Theory of Planned Behavior to guide this evaluation because we wanted to see how people's perceptions of the landing pages match up with their behavior of using these resources. We also used this theory to help interpret the responses to the survey.

The current evaluation, conducted using an online survey, is consistent with the “10 Essential Public Health Services” framework. This framework describes the activities that public health systems should have to promote and protect the health of everyone in all communities (Centers for Disease Control and Prevention, 2024). This framework strives to achieve equity (at the center) through the three main functions: assessment, policy development, and assurance. This framework was updated recently in 2020. Before the update, the services were centered on research. This update signaled a shift from just evidence-based practice and researching these phenomena to promoting equity. Centering equity also means that all public health work will now be aimed at tackling health disparities (Sellers et al., 2021). This project can be considered part of the assurance function in this framework, specifically the “improve and innovate through evaluation, research, and quality improvement” since our survey is part of an evaluation of the resources published by the Washington State Department of Health as an ongoing effort to promote prenatal genetic testing and create a standard of care for all prenatal and preconception patients. Along with assurance, this project also falls under the “communicate effectively to inform and educate” piece of policy development. The purpose of the resources, and for wanting to make them better, is to inform providers about these resources and educate them further on ordering and interpreting prenatal genetic screening and carrier screening. Data collected from this survey will be reported back to the Washington State Department of Health to help edit and update the resources that the Prenatal Genetics Task Force has recently published (assurance)

and will help with the creation of other policies regarding prenatal genetic screening and carrier screening (policy development). **Figure 2** illustrates the 10 Essential Public Health Services Framework.

With feedback from providers, the goal of this evaluation is to make these resources easily accessible, and efficient, and provide all the necessary information to help non-genetic providers make the best decisions for their patients and feel more confident in their ability to do so.

## **Methods:**

### *Survey Approach*

This survey was developed and administered from the Washington State Department of Health and therefore went through the Washington State Institutional Review Board. When submitting this application, we noted that this project was not part of a systematic research process and submitted for exempt status under the condition that this survey was for quality assurance and would be completely anonymous. In order to preserve anonymity, the survey was disseminated by members of the Prenatal Genetics Task Force known only to them. We made sure that the site we used for the survey (Survey Monkey) did not ask for any identifiable information of the respondents.

After the IRB application was approved, creation of the survey began. The main focus of the survey was quality assurance and feedback on the provider landing pages. Therefore, most of the survey was formatted as opinion questions with a mix of multiple-choice and free responses. For help with the format and layout of questions, a doctor from the Prenatal Genetics Task Force who spearheaded the creation of the Task Force put us in contact with another doctor. This doctor has experience with surveys that evaluate efficiencies and is interested in activities that support providers and patients in the community. With the help of these doctors and the State Genetics Coordinator, the survey was created and edited to the pilot form.

The pilot survey was sent out to a small number of providers to gain their feedback on the survey itself (not feedback on the landing pages). This pilot survey was sent out by one Task Force member, the doctor who helped in the creation of the task force and the survey, on March 1, 2024. The pilot survey was open for responses until March 8<sup>th</sup>, 2024, which was only a week

since we were not expecting too many responses. After the pilot closed, further editing was done on the survey based on the feedback we received.

The pilot received four responses. None of these respondents finished the survey from beginning to end; only one person got nearly halfway through this pilot. Because of this, we learned we needed to edit the length of the survey and we cut the survey from 46 questions to 41 questions and eliminated some of the Part A and Part B questions. The official survey used can be found in **Appendix B**.

### *Study Population*

For this project, the total population was estimated to be about 20,563 providers in Washington State who provide direct patient care (Yen, 2020). The target population (different from the total population) was all providers in the State of Washington who provide prenatal care and could potentially be ordering these genetic tests. The number of primary care physicians in Washington State is estimated to be over 6,000 (Yen, 2020). Since primary care is where most of the orders for prenatal genetic screening comes from, we estimated that there are about 6,000 providers in our target population. We used a 90% confidence interval in this calculation, so our margin of error was 10%. Confidence intervals do not reflect variability in unknown parameters, they are instead used to reflect random error in sampling and give a range that the answer is likely to fall into (Sullivan, n.d.). The margin of error, also known as the maximum error of estimation, indicates the precision of an estimate (Mohr et al., 2022). The sample size was

calculated using the formula: 
$$\frac{\frac{z^2 \times p(1-p)}{e^2}}{1 + \left(\frac{z^2 \times p(1-p)}{e^2 N}\right)}$$
 where N is our population size (6,000), e is the

margin of error (10% or 0.10), and z is the z-score for a 90% confidence interval (1.65). Subbing

in our numbers, our equation looked like this:  $\frac{\frac{1.65^2 \times p(1-p)}{0.1^2}}{1 + (\frac{1.65^2 \times p(1-p)}{0.1^2 \times 6,000})}$  and we solved for p, the sample

size. The calculated sample size that needed to be used for this project was 68 providers.

### *Data Collection*

The final version of the survey was emailed to participants by members of the Prenatal Genetics Task Force on March 13<sup>th</sup>, 2024. Networks and personal connections were utilized to email the survey link across Washington State. By doing it this way, the survey responses were completely anonymous and conformed to our IRB guidelines. Only providers whose patient demographics are pregnant individuals and who will find themselves ordering and/or interpreting genetic screening and carrier screening results filled out this survey. Question four asks “Do you order genetic tests such as prenatal screening or prenatal diagnostic tests in your practice,” and is used as the disqualifier question in the survey.

The survey was sent out to several providers and remained open for a total of three weeks. A reminder was sent out at the two-week mark, asking the Task Force members to remind providers to please fill out the survey. Another reminder was sent out on the last week it was open. The survey was closed on April 5<sup>th</sup>, 2024. The responses were then saved for analysis.

## *Data Analysis*

The results from the survey were coded using both deductive and inductive approaches. A deductive approach to coding is starting with codes that were already predetermined before the data analysis began (Medelyan, 2019). Our predetermined codes were created using the Theory of Planned Behavior and the research questions. The theory was chosen since it examines associations between a person's behavior and their intentions, beliefs, and attitudes. Attitude, motivation, and perceived power were pieces pulled from this theory and transformed to fit this evaluation project. **Figure 1** provides detail for how these fit into the theory. The research questions were another factor that was taken into consideration when going into the analysis due to its importance in this evaluation. The codes associated with the research questions were confidence and missing information. A full list of the deductive codes can be seen in **Table 1**.

An inductive approach was also used to do more coding as well. Inductive coding is starting from scratch and making up codes based on the data itself (Medelyan, 2019). The comments were read through multiple times, once when reviewing the results of the survey, again when deductively coding, and then one more time when determining what other codes were apparent. A list of words and phrases that stood out and were mentioned multiple times was the basis of the inductive codes. The first codes in the inductive list were mention of genetic counselors, cost, insurance coverage, and mention of maternal-fetal medicine providers. A full list of inductive codes can be seen in **Table 2**. Once the codes were created and the data was coded, themes were identified utilizing both the deductive and inductive codes.

Responses to multiple choice questions were summarized as a percentage of each response option. Any comments made on these questions were also reported to support the quantitative data. The quantitative and qualitative data were reported to the Department of Health

to help revise and edit the provider landing pages and fact sheets. A full analysis plan can be found in **Appendix C** with a breakdown of each question and how the results were analyzed.

We calculated a statistical significance for determining whether these published landing pages improved provider confidence and ability to order and interpret genetic screening and carrier screening results. To do this, we applied a Wilcoxon signed rank test on paired samples in R (a statistical programming language) to questions 20, 21, 32, and 33 from the survey. We used the Wilcoxon signed rank test to compare each of the questions that asked about before and after reviewing either of the resources and also to compare the carrier screening resources to the prenatal genetic screening resources. We expect to see more of an impact in ordering carrier screening than ordering prenatal genetic screening since carrier screening is a more nascent concept and many providers have limited experience with it (Kraft et al., 2018). We also expect that providers will get the full benefits of the prenatal genetic screening resources related to interpreting results since they have more experience with ordering these tests already.

The Wilcoxon signed rank test is a non-parametric replacement of a t-test that compares the medians of a group of responses (Statistics Solutions, n.d.). We used the Wilcoxon signed rank test because we are dealing with ranked data from paired observations. In this statistical analysis, the smallest V-statistic and p-value with a 95% confidence interval were calculated.

## **Results:**

### *Demographics*

There was a total of 37 responses to the survey. We report here on the key points and important results. A full list of results for each question can be found in **Appendix D**. Most of those who responded to this survey (35.5%) were located in the South Puget Sound Region, but we had a few from the Seattle area (19.4%) and Northwest regions (22.6%) as well. 93.5% of respondents practiced in a more urban area, 3.2% were located in a rural area, and 3.2% responded “other”. By the comment left it seems that the person who chose “other” felt they were between urban and rural. The respondents had an average of 13 years of practice in their field of medicine, ranging from 1.5 years to 40 years. There was also an average of 31 obstetrical patients seen on average in a week in their clinics.

When asked what resources these providers use for ordering and interpreting genetic tests, the majority (40%) responded that they utilize genetic counselors and 28% responded that they use the American College of Obstetricians and Gynecologists. The responses indicated using resources from Epic and LabCorp labs, literature or newsletter updates, known/routine screening standards, self-created resources or knowledge, and Up to Date. Insurance coverage was listed as a common barrier for 38.5% of those who ordered prenatal genetic screening tests and was also a common barrier for 30.8% of those who ordered carrier screening tests. Another common barrier was lack of knowledge about what labs/tests to order. No barriers were reported for 69.2% of respondents who interpret prenatal genetic screening results, and no barriers were also reported for 80.7% of respondents who interpret carrier screening results. Regarding counseling patients, 11 responses for prenatal genetic screening (44%) and 15 responses for carrier screening (60%) indicated there were no barriers. There was also a general consensus that

referring patients to genetic counselors was the preferred method for counseling. There were eight (16%) reports of concern regarding patients' health/medical/genetic literacy, which made it difficult for these providers to discuss. There was also mention of language barriers (18%) and time constraints (8%) that also make it difficult for patient-provider discussions. Common resources directed for patient use were genetic counselors (23%), institutional resources (26.9%), maternal-fetal medicine specialties (11.5%), and the American College of Obstetricians and Gynecologists resources (11.5%).

### *Carrier Screening Landing Page*

The carrier screening landing page flowed cohesively for 95.7% respondents, and only one person responded with “I prefer not to say.” One comment made for this question was that the landing page should be available in more languages. 19 out of 22 (86.4%) providers said the “Current Carrier Screening Guidelines” section did not need any more information added, but two people indicated that there was information that could be added. Those who responded “yes” commented that cost and insurance coverage estimates were missing and one comment from someone who responded “no” said this section was “very straightforward and comprehensive.” Questions 20 a. and 20 b. asked about confidence in ordering carrier screening before and after looking over these resources. Before utilizing the resources, 45.8% of respondents indicated they were “very confident.” After utilizing these resources, 62.5% of respondents indicated they were “more confident.” Questions 21 a. and b. asked about confidence in interpreting carrier screening results before and after looking over these resources. Before having the resources, 50% said they were “somewhat confident” and 41.7% said they were “very confident.” After reviewing the resources, 62.5% said they were at the “same” confidence level as before, and 37.5% said they felt “more confident.” In the *Quantitative Comparisons of Responses Before and After Reviewing*

*Resources* section below, we provide a more detailed discussion regarding the changes in confidence.

### *Carrier Screening Fact Sheet*

When asked if the carrier screening fact sheet flowed cohesively, 23 out of 24 (95.8%) respondents agreed that it did. Feedback included a suggestion to change the orientation of the table so that the boxes are not so narrow. When asked if the “Questions to ask your prenatal and preconception patients” section needed any improvement, 87.5% of respondents agreed that it did not, and 8.3% said it could use improvements. In particular, one respondent pointed out that there is no clear guidance on insurance coverage. The Carrier Screening Decision Tree did not need to be improved according to 90.9% of responding providers. In fact, one of these respondents commented that they were “glad dissemination was included” in this decision tree. There was one response for “yes” and one for “I prefer not to say” for the question “Is there anything from the Carrier Screening Decision Tree that needs improvement?” The person who responded “yes” commented that the arrows covered text and expressed concern about the order of testing being suggested.

### *Prenatal Genetic Screening Landing Page*

There was no information missing from the “Conditions Detected by Prenatal Genetic Testing” section for 22 out of 23 (95.6%) responding providers. Feedback from the one respondent who responded “yes” said that basic terms were missing. For the next section, “Insurance Frequently Asked Questions for Providers,” 95.5% of respondents said nothing was missing and 4.6% of respondents said that there was information missing. Comments on items missing or needing improvement included cost estimates, insurance coverage, and changing the

title to be worded better. Questions 32 a. and b. were designed to assess the confidence of providers in ordering prenatal genetic screening before and after looking over the Department of Health resources. Before reviewing the resources, 60.8% of providers said they felt “very confident” in ordering prenatal genetic screening. The same percentage said they felt “the same as before” after reading and reviewing this guidance. Questions 33 a. and b. were used to determine confidence in interpreting prenatal genetic screening results before and after having these resources handy. Before having the resources, 47.8% of the providers said they were “very confident” and 39.1% of respondents were only “somewhat confident.” After having the resources handy, 52.2% of respondents said they felt “the same as before” and 47.8% said that they felt “more confident.” Again, we will look into the statistical analysis of these responses in the *Quantitative Comparisons of Responses Before and After Reviewing Resources* section.

#### *Aneuploidy Screening Fact Sheet*

When asked if the “Task Force Recommendations” section was missing any information, only two participants (8.7%) responded “yes.” There was a comment that these resources were “expecting too much from the provider” since “insurance coverage seems to change all the time.” For the prenatal aneuploidy screening detection roadmap, 8.7% of respondents said it needed to be improved. Comments pointed out the inconsistency with the word “offer” and suggested all items should be offered and a nuchal translucency ultrasound should be recommended over an early anatomy ultrasound. Feedback from the Prenatal Aneuploidy Screening Bloodwork Screening Roadmap stated that the roadmap was missing information for 9.09% of respondents. Comments stated that it was confusing to follow and pointed out that some tests suggested in this roadmap were not used in populations over 35 years of age anymore.

## *Glossary*

We learned the glossary was not easily accessible for five respondents (21.7%) and comments pointed out that there were too many clicks and drop-down menus to get to it. The responses noted that around 24% of these respondent's patients were non-native English speakers. We also learned that some of the most common languages these providers suggest translating the glossary into are Dari, Mandarin, Russian, Somali, and Spanish. (The glossary is already available in Spanish, Russian, Ukrainian, Marshallese, and Vietnamese.)

## *Overall Feedback*

We received an impressive amount of positive feedback from this survey. We found that overall, 91.3% of respondents found these resources "very helpful" and only 8.7% felt "neutral" about the resources. When asked if these resources met all the needs of these providers and others in their field, 100% responded "yes." When asked if there was anything they wished was included, 91.3% said "no" and 8.7% said "yes." Comments on this question suggested adding cost estimates, suggestions for screening in twins, and more suggestions/statements around maternal age and what tests would be best to order for older women. One comment also mentioned that time constraints are a big barrier and they suggested creating a shorthand version with the flow charts front and center. We asked one last time if these providers felt more confident knowing that these resources were available for them to use, and we saw 22 (95.6%) responses for "yes" and only one response for "no."

### *Quantitative Comparisons of Responses Before and After Reviewing Resources*

The p-value for the Wilcoxon test comparing ordering carrier screening before and after reviewing the resources was 0.005972 with a 95% confidence interval of (0.1173, 2.0717). Because this was smaller than our threshold of 0.05, there was a difference detected in the median values before and after. The Wilcoxon test p-value for interpreting carrier screening before and after using the resources was 0.1198 with a 95% confidence interval of (-0.8857, 0.7407). Since this p-value was greater than the threshold, no difference was detected in these results.

The p-value from the Wilcoxon test for ordering prenatal genetic screening was 0.3905 with a 95% confidence interval of (-1.081, 1.681), and no difference was detected in the medians at this time. However, for confidence in interpreting prenatal genetic screening before and after utilizing the resources, we saw a p-value of 0.04368 and a 95% confidence interval of (-1.081, 1.681) from the Wilcoxon test. This means there was a difference detected between the medians.

Comparing provider confidence in ordering carrier screening to confidence in ordering prenatal genetic screening, we found a p-value of 0.0595 and a 95% confidence interval of (-0.390, 0.336) showing that there was no difference detected in the medians of these groups. When we compared provider confidence in interpreting carrier screening results to confidence in interpreting prenatal genetic screening results, we saw a p-value of 0.5297 with a 95% confidence interval of (-0.2205, 0.2085) showing that again there was no difference detected in the medians of these groups either.

### *Themes from Qualitative Data Analysis*

During qualitative data analysis, we found that cost was mentioned 12 times throughout the whole survey, and insurance coverage was mentioned 27 times. Three themes became apparent from coding. They were: 1) lack of knowledge/confidence is a motivation for providers to use these resources, 2) concerns for cost and lack of knowledge of insurance coverage were a common point of contention, and 3) positive feedback centered on how comprehensive and helpful the resources will be for future use. **Table 3** lists the themes, correlating quotes, and which codes helped develop these themes.

Two codes that came up many times were the mention of a genetic counselor and the mention of maternal-fetal medicine specialists. Genetic counselors appeared 34 times throughout the survey and maternal-fetal medicine practitioners were mentioned 11 times. There were also many provider resources mentioned, but not so many patient resources were reported. A full table of how many times each code was applied can be found in **Figure 3**.

## **Discussion:**

This project aimed to determine if the online resources provided by the Washington State Department of Health helped non-genetics-trained providers increase their confidence in ordering and interpreting carrier screening and prenatal genetic screening tests. It also aimed to gain feedback from these providers on the quality of the resources and determine if any additional information was needed to clarify the resources. This was accomplished using an online survey that gathered adequate feedback from providers and helped determine whether the resources increased confidence in both ordering and interpreting genetic testing and carrier screening.

Regarding our first research question, we did detect that for ordering carrier screening tests and interpreting prenatal genetic screening results there was a confidence increase after reviewing the Department of Health resources. This suggests that these published resources could be useful for other providers who are not experts in genetics but order carrier screening for their patients. This relates back to our hypothesis which stated that the carrier screening resources would be more beneficial for ordering tests since it is a newer concept to these providers and the prenatal genetic screening resources would be more beneficial for interpreting these results. Since no difference was detected in confidence between the ordering carrier screening group and the ordering prenatal genetic screening group, we can infer that the resources are performing at the same level and fulfilling their purposes. We cannot definitively say if there was a confidence increase because our sample size made it more difficult to differentiate between a real effect and random variation (Hackshaw, 2008).

In answering the question, “Is there anything missing from the published resources to make it more impactful?,” we found that for the carrier screening landing pages and fact sheets,

the biggest feedback was the need for these resources to be translated into more languages, providers wanted cost and insurance estimates to be added, and these resources were too much information for a busy provider to review when in a rush. These resources were not meant to give cost and insurance estimates but rather to guide providers in what tests can be ordered, in what order, and what to do when the results come back. Since these resources are meant for providers, not patients, having them in both Spanish and English is sufficient. Out of the resources evaluated, the glossary is the most important resource to be translated into more languages since it is patient-facing. The glossary is already available in five languages: Spanish, Vietnamese, Marshallese, Ukrainian, and Russian. Based on feedback for the glossary, it could also be translated into Dari, Mandarin, or Somali as well. The last piece of feedback surrounding information overload is important for the Department of Health to consider. The fact sheets are designed as a short-hand, simplified, and easy to look over document that providers can refer to. The fact sheets contain flow charts and tables that require little reading, while the landing pages have more writing and information to consider.

Positive feedback that we received from the carrier screening resources were that they were “straightforward and comprehensive,” very glad dissemination was included, and the flowsheets and questions to ask are very helpful. These results were very satisfying because the overall goal was to make sure these resources had information that would be helpful and included items that might be overlooked by some providers.

For prenatal genetic screening, we found the most important feedback to be on cost/insurance estimates, maternal age, and that these resources are expecting too much of providers. Again, these resources were not meant to give cost and insurance estimates. Including these concepts would take too much time and effort to compile since there are many insurance

providers and insurance benefits vary from clinic to clinic and person to person. To address the concerns around maternal age, the Department of Health should explicitly state what age group the task force recommended tests would benefit and add a statement that says there are different recommendations for different populations. The comment that these resources are asking too much of providers was a strong piece of feedback to consider. Sending patients home with resources and tasking them with ascertaining their own insurance benefits can combat this extra workload for the provider. Medical assistants or other assistant personnel could also be an active member in helping to decipher insurance coverage, cost, accuracy, and false positive rates of tests.

Overall positive feedback we received from these prenatal genetic resources were that they were “an excellent, comprehensive repository of information surrounding genetic testing,” “wish they knew about these resources earlier” to start using them, and they were a job well done. Hearing these positives made this whole process worth it, because the goal was to publicize these resources and make sure they would be helpful and used by providers. All of this feedback will help edit the resources or create future resources to address these concerns more thoroughly. A table of recommendations can be found in **Table 4**.

In our comparisons, we found there was a difference detected between the medians in the responses for before and after reviewing the resources for confidence in ordering carrier screening, but there was no difference detected between the medians in the before and after for confidence in interpreting carrier screening. We had hoped to see a confidence increase each time the providers were able to review the resources, but that was not what we saw in the results. This lets us know that the resources made an impact in educating the providers to help increase their confidence when ordering carrier screening. Now we know to focus more effort on

increasing confidence for interpreting carrier screening. This is significant because these providers might not have enough experience with carrier screening. Improving their confidence and ability to order these tests ensures that the right tests will be ordered for patients seeking carrier screening. Ordering the incorrect tests can be harmful to patients both in terms of the amount of bloodwork they have to do and in the sense of false positive or false negative results perpetuating unnecessary stress onto patients, as mentioned in the *Background section*.

In our comparisons for prenatal genetic screening, we observed significant differences in confidence increases before and after reviewing the resources for interpreting prenatal genetic screening results, but not for ordering these tests. Here again, we only achieved our goal of increasing confidence in one area, interpreting prenatal genetic screening. The survey results support the effort to provide more resources to help providers gain more confidence in knowing what tests to order for their patients. As it was pointed out earlier in the results, the mention of genetic counselors was the most used code in data analysis with 34 mentions. We know that interpreting genetic results has always been in the realm of genetic counselors, but these resources are here to make it so that not every patient needs to be referred to a genetic counselor. These landing pages and fact sheets are here to guide providers on how to interpret simple results and create a better pipeline for referring to genetic counselors on more complex results.

When comparing the two resources to each other, we saw the p-value was larger than the significance level, so we accepted the null hypothesis in both cases. These results tell us that neither of the resources outshined the other, so they are both performing evenly.

The Theory of Planned Behavior helped in the analysis of the qualitative data by helping with the development of codes and themes. The deductive codes that came from the theory included: *attitude toward ordering/interpreting carrier screening, attitude toward*

*ordering/interpreting prenatal genetic screening, motivation to use resources, and perceived power of resource use.* Use of the Theory of Planned Behavior helped to gain a better understanding of provider attitudes toward the new resources and their motivation for using these resources. Just as one of the themes insinuated, a potential motivation for the use of these resources was a lack of confidence or needing more help with ordering and interpreting results. As stated earlier, this project and the subsequent survey were aimed at gaining feedback, but it could have been more beneficial to incorporate the theory more into the survey and determine if there was an attitude shift or change in motivation or perceived power of these resources.

Based on the overall feedback we received from the survey, the Washington Department of Health resources have the potential to make an important contribution for Washington State health care providers and their patients. One of the strengths of this project was gaining open and honest feedback from providers throughout the survey. The providers who responded did not appear to be afraid to give their honest opinions and that is a major win when you are looking for feedback to improve resources. Another strength was utilizing a survey for data collection that was easy to create and disseminate, efficient, and allowed the providers to access it whenever they had enough time. Lastly, another strength of this survey was its ability to bring more attention to these newly published resources. Many respondents stated they did not know about these resources before participating in the survey or they knew about them but never had a chance to review them before. Some respondents even said they would encourage patients and other providers to use them. These findings suggest that broader communication efforts to increase provider knowledge about these resources would be worthwhile.

One of the primary limitations of this research lies in the sample size, which may have implications for the power of these results. Power is an internal validity issue which means the

results from this survey cannot rule out chance since the sample size is small. As discussed in the *Methods* section, the expected sample size was 68 responses to the survey, and our actual collected responses was barely 37. This was, in all likelihood, due to the length of the survey and the allocated time it would take for someone to complete it, combined with how the day-to-day workflow is for a provider. This also raises concerns about selection bias since providers who elected to participate were not the same as the providers who did not participate in the survey. Because of this, our sample does not accurately reflect our target population (Alexander et al., 2015). Most of our responses came from providers mostly located in urban areas of the South Puget Sound region. This may not allow for obtained feedback to be generalizable to all providers in the whole state of Washington. The responses we received are better aligned with more urban areas and the South Puget Sound region. Another limitation of this project was our inability to email participants directly. In order to expedite our IRB application, we filed for an exempt status which required us to uphold complete anonymity. To do this, we enlisted the help of all the Prenatal Genetics Task Force Members and asked them to disseminate the survey. In doing this, we had to rely on the task force members to send the survey out to as many people as they knew and to also send out the reminders that we requested. And since we relied so heavily on the Prenatal Genetics Task Force to disseminate the survey, we had no real way of knowing how many providers were sent the link and were asked to participate. Lastly, because this survey was more aimed at quality assurance and feedback, there was no way to say if there was a difference in the behavioral intention and behavior outcome in these providers. However, we hoped that by providing easy access and guidance to these landing pages, it would allow providers to change their attitudes and increase perceived control of ordering and interpreting prenatal genetic tests and carrier screening.

## Conclusion and Recommendations:

To ensure that prenatal genetic screening and diagnostic testing is being utilized to its full capacity, resources and guidelines should be made available to all providers who may be ordering genetic screening tests. The first step is to create resources that all providers can easily access whenever they need to. This step was completed before this project began by the Prenatal Genetics Task Force. The next step was ensuring these resources were helpful and would make a difference in this space. The survey results confirmed that the resources created are helpful, full of necessary and correct information, and can help increase confidence in non-genetic providers who order genetic testing for their prenatal and preconception patients. This project used the 10 Essential Public Health Services framework as guidance and aimed for quality assurance and in turn furthered equity for all prenatal and preconception patients seeking care in Washington State.

We found that overall, the resources created and published by the Washington State Department of Health were very helpful and for the most part, met the needs of these providers. The providers that responded indicated that they felt more confident knowing that these resources were available for use through the Washington Department of Health website.

It is important to take into consideration all the feedback that was received through this evaluation. However, there is also no way to please every provider in the state of Washington. The main concerns that came up multiple times were cost and insurance coverage estimates, so this was important to address. Other important concerns were languages, time constraints, maternal age, and expecting too much of providers. **Table 4** gives a quick breakdown of recommendations for the Department of Health based on feedback received.

More recommendations based on the goals of our first research question regarding increasing confidence can also be seen in **Table 4**. These recommendations are to improve provider confidence in interpreting carrier screening test results and ordering prenatal genetic screening tests, since the survey responses conveyed a confidence increase in ordering carrier screening tests and interpreting prenatal genetic screening results. The recommendations to improve provider confidence in ordering carrier screening tests are to create more resources and focus them on carrier screening or add more information to these resources on interpreting carrier screening results. The recommendation for improving interpreting prenatal genetic screening is to offer refresher courses to more experienced providers and task them with reviewing updated guidelines and changes to workflows to make sure they are aware of any changes.

There are several areas for potential future research. One area includes investigating how the WAC update has affected the ordering of prenatal genetic screening and tests. It would be interesting to see if these updates made a difference in what panels were ordered or changed patients' minds about getting genetic screening/testing done. Another area for future research is feedback from every person who visits the Washington Department of Health website to gather more insight on use and how the resources have helped. Additional areas of potential research within prenatal genetic screening that could be explored include the percentage of people who get these tests done every year, the number of women who have tests ordered in non-genetic settings, and the average cost and insurance coverage for conditions included in the recent WAC update.

**Figures:**

Figure 1: The Theory of Planned Behavior

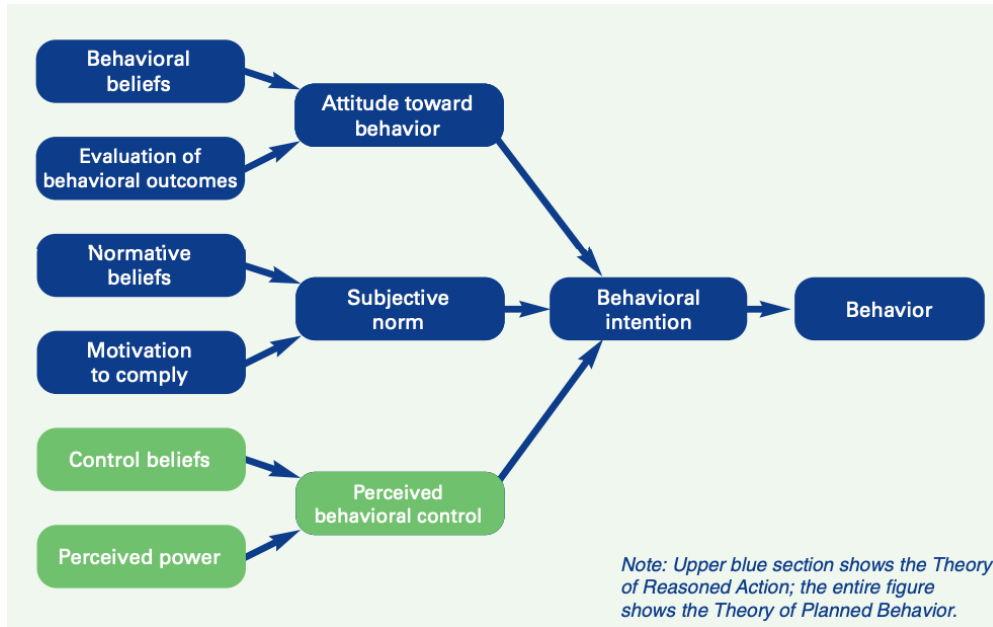


Figure 2: 10 Essential Public Health Services Framework

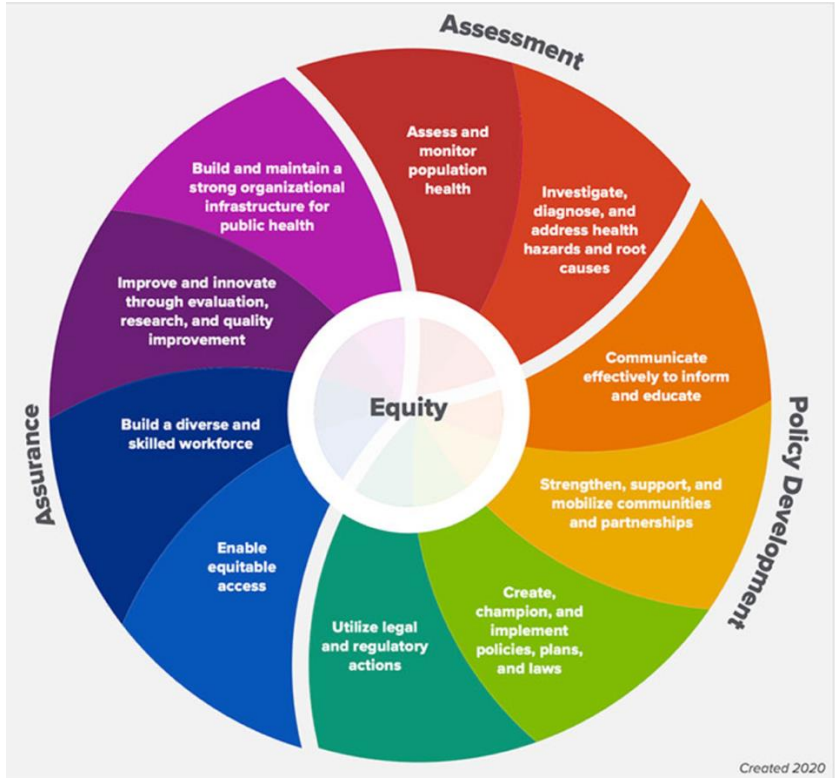


Figure 3: Total Number of Codes Applied

Media	Codes																					
	Attitude toward ordering/interpreting	Attitude toward ordering/interpreting	Confidence in ordering/interpreting	Confidence in ordering/interpreting	Cost	Importance of genetics	Insurance coverage	Language	Mention of GC	Mention of MFM	Missing information	Motivation to use resources	Negative feedback	Patient education	Patient resources	Perceived power of resource use	Positive feedback	Provider resources	Rare findings	Suggestions for improvement	Time	Totals
All Comments from Survey.docx	15	10	3	6	12	3	27	11	34	11	1	10	10	8	11	2	8	21	14	13	7	237
Totals	15	10	3	6	12	3	27	11	34	11	1	10	10	8	11	2	8	21	14	13	7	

**Tables:**

Table 1: Deductive Codes

Attitude toward ordering/interpreting Carrier Screening (CS)
Attitude toward ordering/interpreting Prenatal Genetic Screening (PGS)
Confidence in ordering/interpreting Carrier Screening (CS)
Confidence in ordering/interpreting Prenatal Genetic Screening (PGS)
Missing information
Motivation to use resources
Perceived power of resource use

Table 2: Inductive Codes

Cost
Importance of Genetics
Insurance coverage
Language
Mention of Genetic Counselors (GC)
Mention of Maternal Fetal Medicine (MFM)
Negative feedback
Patient education
Patient resources
Positive feedback
Provider resources
Rare findings
Suggestions for improvement
Time

Table 3: Themes with supporting Quotes and Codebook

Theme	Quote	Codebook
Lack of knowledge/confidence is a motivation for providers to use these resources	“lack of knowledge about abnormal results,” “I can only really discuss confidently some of the most common findings, not any of the more rare diseases”	Motivation to use resources (deductive) and rare findings (inductive)
Concerns for cost and lack of knowledge of insurance coverage were a common point of contention	“there is always things missing and insurances are changing all the time” “COST!!!!”	Cost (inductive), insurance coverage (inductive), negative feedback (inductive), missing information (deductive), and attitude toward ordering/interpreting PGS (deductive)
Positive feedback centered on how comprehensive and helpful the resources will be for future use	“I find this website very comprehensive” “This is an excellent, comprehensive repository of information surrounding genetic testing.”	Positive feedback (inductive)

Table 4: Recommendations Based on Feedback and Results

Recommendations for WA DOH	
Concern/suggestion from evaluation	Recommendation
Cost/insurance coverage estimates	Make another resource for estimates from popular insurance providers, have patients research their specific insurance benefits, or utilize assistants
Add more languages	Provider resources sufficient in English and Spanish, glossary and other patient resources can be translated into Dari, Mandarin, or Somali as well
Maternal age	Make another resource related to how to handle maternal age and link it within these resources; also note that these recommendations are for populations within a certain age
Expecting too much of providers	Utilizing medical assistants or other assistant personnel to help decipher insurance coverage, cost, accuracy, and false positive rates of tests can lessen burden on providers
Too hard to find the glossary	Make the glossary its own PDF document and link it within the landing pages the same way the fact sheets are linked
Interpreting Carrier Screening	Focus more resources or add more information to these resources on interpreting CS results
Ordering Prenatal Genetic Screening	Offer refresher courses and remind experienced providers to review updated guidelines and changes to workflows

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# Appendix A

## Prenatal Genetic Screening for Providers | Washington State Department of Health

The screenshot shows the Washington State Department of Health website. At the top left is the logo with the text "Washington State Department of HEALTH". To the right are links for "About Us", "Contact Us", and "Newsroom", and a search bar. A dark blue navigation bar contains menu items: "You & Your Family", "Community & Environment", "Licenses, Permits, & Certificates", "Data & Statistical Reports", "Emergencies", and "Public Health & Provider Resources". Below this is a breadcrumb trail: "Home | Public Health & Provider Resources | Healthcare Professions And Facilities | Patient Care Resources | Genetic Services | Prenatal Genetic Screening Resources For Providers".

The main content area has a dark blue sidebar on the left titled "In this section" with a "Genetic Services" sub-section. The sidebar lists: "Carrier Screening", "Cascade Screening", "Hereditary Breast and Ovarian Cancer Syndrome", "Hereditary Cancer Resources for Providers", "Lynch Syndrome", and "Prenatal Genetic Screening Information for Patients".

The main content area features a yellow "English" language selector. The title is "Prenatal Genetic Screening Resources for Providers". The text states: "Washington State Law (RCW 70.54.220) says that doctors, nurses, and midwives should provide information about prenatal screening to all pregnant persons. A health care provider can detect some genetic and physical differences prenatally, but some can't be detected until after birth."

Below the text is a section titled "Prenatal Screening" with the text: "Prenatal screening during pregnancy can help identify information on fetal health such as congenital disorders and genetic conditions."

## Carrier Screening | Washington State Department of Health

The screenshot shows the Washington State Department of Health website. At the top left is the logo with the text "Washington State Department of HEALTH". To the right are links for "About Us", "Contact Us", and "Newsroom", and a search bar. A dark blue navigation bar contains menu items: "You & Your Family", "Community & Environment", "Licenses, Permits, & Certificates", "Data & Statistical Reports", "Emergencies", and "Public Health & Provider Resources". Below this is a breadcrumb trail: "Home | Public Health & Provider Resources | Healthcare Professions And Facilities | Patient Care Resources | Genetic Services | Carrier Screening".


The main content area has a dark blue sidebar on the left titled "In this section" with a "Genetic Services" sub-section. The sidebar lists: "Carrier Screening", "Cascade Screening", "Hereditary Breast and Ovarian Cancer Syndrome", "Hereditary Cancer Resources for Providers", "Lynch Syndrome", and "Prenatal Genetic Screening Information for Patients".

The main content area features a yellow "English" language selector. The title is "Carrier Screening". The text states: "Carrier screening looks for possible genetic conditions that people can be carriers for. Most people do not know if they are a carrier of a disease without this screening. Typically, if both the pregnant patient and their partner are carriers of the same genetic condition, there is a risk that their child could be affected by the condition."

Below the text is another paragraph: "Most carrier screening is for recessive disorders, which means both biological parents must have disease-causing changes in the same gene for their child to be affected. Recessive disorders are conditions where both copies of the same gene need to be altered to cause the disease. The parents are unaffected because they only have one copy of the altered gene. The screening can be done before or during pregnancy using a blood sample, saliva, or cheek swab. It can help the patient learn more about risks and make informed decisions."

Below the text is a blue button with a document icon and the text "Carrier Screening Fact Sheet for Providers" followed by a right-pointing arrow.

Below the button is the text: "This resource was created by the Washington State Department of Health's Prenatal Genetics Task Force to equip non-genetic providers with a clinical workflow when ordering both types of carrier screening panels –targeted screening panels"



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| Prenatal Genetic Screening Information For Patients

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English

## Prenatal Genetic Screening Information for Patients

Prenatal screening helps you find out how your baby is doing through pregnancy. It can check for congenital disorders (birth defects) and genetic conditions (new or inherited changes in DNA). Birth defects are physical differences with how the body works that are present before or at birth. These changes can affect any part of the body. A health care provider can detect some genetic and physical differences during pregnancy, but some can't be detected until after birth.

Prenatal screening can be complex and confusing. Washington State Law ([RCW 70.54.220](#)) says that doctors, nurses, and midwives should provide information about prenatal screening to all pregnant persons.

There are two types of prenatal tests to assess the health of your baby: prenatal screening tests and prenatal diagnostic tests.

## **Appendix B**

### **Demographics**

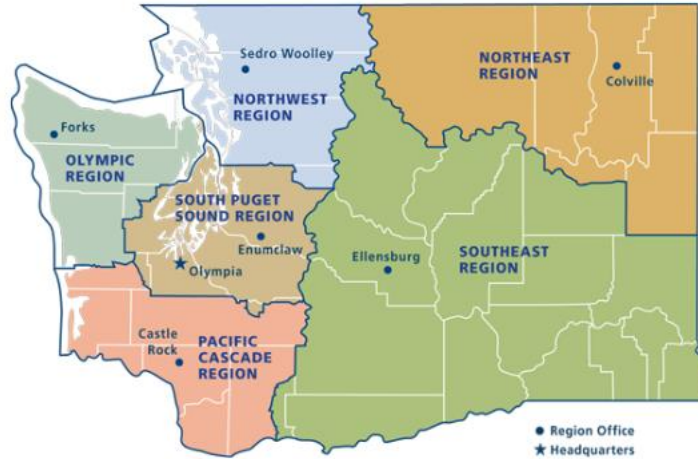
**Questions 1-7 are about provider and clinic demographics.**

1. How many years have you been practicing? \* \_\_\_\_\_
2. How many obstetrical patients do you see in a week? (Please give your best estimate.)  
\_\_\_\_\_
3. Would you say that genetics and genomics is important in your scope of practice? Please explain your answer in the space provided.
  - a. Yes
  - b. No
  - c. I prefer not to say  
\_\_\_\_\_  
\_\_\_\_\_

4. Do you order genetic tests such as prenatal screening or prenatal diagnostic tests in your practice? (If no, please explain how you manage genetic counseling in your practice in the space provided.)
  - a. Yes
  - b. No
  - c. I prefer not to say  
\_\_\_\_\_  
\_\_\_\_\_

**If you answered no to the previous question, you may exit the survey here. If you believe you will be ordering prenatal genetic tests in the future, you may choose to continue the survey.**

5. In which region of Washington State do you predominantly practice? (Please specify what region and city – utilizing the map below. If you predominantly work remotely i.e., telehealth please mention below. Thank you!)
  - a. \_\_\_\_\_  
\_\_\_\_\_
  - b. I prefer not to say



6. Is your clinic located in a more rural or urban area?
  - a. Mostly Rural
  - b. Mostly Urban
  - c. I prefer not to say
  - d. Other (please specify): \_\_\_\_\_
7. Approximately what percentage of your patients are non-native English speakers?  
 \_\_\_\_\_  
 \_\_\_\_\_

**Knowledge and Use**

**Questions 8-14 are aimed at understanding knowledge and use of genetics in your scope of practice.**

8. How would you rate your baseline prenatal genetic screening/testing knowledge?
  - a. I know the fundamental concepts
  - b. I am comfortable with the fundamental concepts
  - c. I regularly counsel patients on genetic screening and testing
  - d. I prefer not to say
  - e. Other (please explain): \_\_\_\_\_  
 \_\_\_\_\_
9. What resources do you currently utilize for ordering and interpreting genetic tests?  
 \_\_\_\_\_  
 \_\_\_\_\_
10. How often do you refer a patient to genetic counseling when they ask questions regarding genetic diseases?\*

  - a. Always
  - b. Sometimes
  - c. Rarely
  - d. Never

- e. I prefer not to say
- f. Other (please explain):

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11. a) Are there specific barriers you encounter when **deciding what prenatal genetic screening/diagnostic test(s) to order?**

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11. b) Are there specific barriers you encounter when **interpreting prenatal genetic screening/diagnostic test results?**

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11 c) Are there specific barriers you encounter when **counseling your patients based on prenatal genetic screening/diagnostic test results?**

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12 a) Are there specific barriers you encounter when **deciding what prenatal carrier screening panel to order?**

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12 b) Are there specific barriers you encounter when **interpreting prenatal carrier screening results?**

---

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12 c) Are there specific barriers you encounter when **counseling your patients based on prenatal carrier screening results?**

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13 Do you recommend carrier/prenatal screening to your prenatal and preconception patients? (Please explain your answer further in the space provided.)

- a. Always
- b. Sometimes
- c. Rarely
- d. Never
- e. I prefer not to say
- f. Other

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- 14 Do you direct patients to any prenatal or preconception resources when they have questions regarding genetic testing or carrier screening? (If yes, please explain what resources you direct patients to in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

**Questions 15 and 16 are aimed at evaluating the Carrier Screening Landing Page. The Carrier Screening Landing Page can be found at this link: [Carrier Screening | Washington State Department of Health](#)**

- 15 Does the Carrier Screening Landing Page flow cohesively? (If no, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

- 16 Is there any information that could be added to the section titled “Current Carrier Screening Guidelines” on the Carrier Screening landing page? (If yes, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

**Questions 17 - 21 are aimed at evaluating the Carrier Screening Fact Sheet. The Carrier Screening fact sheet can be found at this link: [Carrier Screening | Fact Sheet | Washington State Department of Health](#)**

- 17 Does the Carrier Screening Fact Sheet flow cohesively? (If no, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

- 18 Is there anything from the section titled “Questions to ask your prenatal and preconception patients” in the Carrier Screening Fact Sheet that needs improvement? (If yes, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

- 19 Is there anything from the Carrier Screening Decision Tree that needs improvement? (If yes, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

20. A) **BEFORE** reading this guidance, I felt \_\_\_ about **ORDERING** carrier screening for patients.\*
- a. Very confident
  - b. Somewhat confident
  - c. Neutral
  - d. Less confident
  - e. I prefer not to say

20. B) **AFTER** reading this guidance, I feel \_\_\_ about **ORDERING** carrier screening for patients.\*
- a. More confident
  - b. Same as before
  - c. Less confident
  - d. I prefer not to say

21. A) How confident were you in your ability to **INTERPRET** carrier screening results to patients **BEFORE** having this guidance?
- a. Very confident
  - b. Somewhat Confident
  - c. Neutral
  - d. Not confident
  - e. I prefer not to say

21. B) How confident are you in your ability to **INTERPRET** carrier screening results to patients **AFTER** reading this guidance?
- a. More confident
  - b. Same as before
  - c. Less confident
  - d. I prefer not to say

**Questions 22 - 26 are aimed at evaluating the Prenatal Genetic Screening Landing Page. The Prenatal Genetic Screening Landing Page can be found at this link: [Prenatal Genetic Screening Resources for Providers | Washington State Department of Health](#)**

22. Does the Prenatal Genetic Screening Landing Page flow cohesively? (If no, please explain in the space provided.)

- e. Yes
  - f. No
  - g. I prefer not to say
- 
- 

23. Do you think there is any information missing from the section titled “Conditions Detected by Prenatal Genetic Testing” on the Prenatal Screening landing page? (If yes, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

24. Do you think there is any information missing from the section titled “Timeline of Prenatal Genetic Tests” on the Prenatal Screening landing page? (If yes, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

25. Do you think there is any information missing from the “Insurance Frequently Asked Questions for Providers” section on the Prenatal Screening landing page? (If yes, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

26. Do you think there is any information missing from the “CPT Codes and Billing” section on the Prenatal Screening landing page? (If yes, please explain in the space provided.)
- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

**Questions 27 – 33 are aimed at evaluating the Aneuploidy Screening Fact Sheet. The Aneuploidy Screening Fact Sheet can be found at this link: [Aneuploidy Screening | Fact Sheet | Washington State Department of Health](#)**

27. Does the Aneuploidy Screening Fact Sheet flow cohesively? (If no, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

28. Do you think there is any information missing from the “Task Force Recommendations” section on the Aneuploidy Screening fact sheet? (If yes, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

29. Is there anything from the Prenatal Aneuploidy Screening Detection Roadmap that can be improved? (If yes, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

30. Was there any information from the Prenatal Aneuploidy Screening Bloodwork Screening Roadmap that you wish was included? (If yes, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

31. Was there any information from the Prenatal Screening Positive cfDNA Flowchart that you wish was included? (If yes, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

32. A) How would you rate your confidence in **ORDERING** prenatal genetic screening/testing for patients **BEFORE** this guidance?\*

- a. Very confident
- b. Somewhat Confident

- c. Neutral
- d. Not confident
- e. I prefer not to say

32. B) How would you rate your confidence in **ORDERING** prenatal genetic screening/testing for patients **AFTER** this guidance?\*

- a. More confident
- b. Same as before
- c. Less confident
- d. I prefer not to say

33. A) How confident were you in your ability to **INTERPRET** prenatal genetic screening/test results to patients **BEFORE** having this guidance?\*

- a. Very confident
- b. Somewhat Confident
- c. Neutral
- d. Not confident
- e. I prefer not to say

33. B) How confident are you in your ability to **INTERPRET** prenatal genetic screening/test results to patients **AFTER** reading this guidance?\*

- a. More confident
- b. Same as before
- c. Less confident
- d. I prefer not to say

**Questions 34 and 35 are aimed at evaluating the Genetics Glossary of Prenatal Terms. The glossary can be found on either the Carrier Screening or Prenatal Genetic Screening Landing Pages under the “Resources” section, in the “DOH Resources” subsection. On either landing page, it is the third option in the dropdown menu.**

34. Is the glossary easily accessible? (If no, please explain in the space provided.)

- a. Yes
- b. No
- c. I prefer not to say

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35. Based on your patient population, what languages do you think would be most beneficial to have the glossary translated into?

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**Questions 36 - 41 are aimed at gaining a better understanding of all the resources and information on the landing pages and facts sheets.**

36. Overall, how helpful do you find these resources? (Please leave any comments in the space provided.)

- a. Very helpful
  - b. Neutral
  - c. Not helpful
  - d. I prefer not to say
- 
- 

37. Prior to this survey, were you aware that the Washington State DOH had created resources for prenatal providers ordering carrier screening and prenatal genetic screening? This includes all glossaries, clinical workflows, videos for patients, fact sheets, guidance, and insurance FAQ's for patients and providers. Please leave any comments in the space provided.

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

38. Do you feel that the information and resources provided met all needs? (Please leave any comments or further explanations in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

39. Is there anything you wish was included in this guidance that you think may be helpful? (If yes, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
- 

40. Do you feel more confident knowing that these resources from the Washington State Department of Health are available for your use? (If no, please explain in the space provided.)

- a. Yes
  - b. No
  - c. I prefer not to say
- 
-

41. Do you have any other feedback on anything else we have not addressed with these resources?

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\*indicates questions that required an answer before moving on

## Appendix C

Comparison?	Question	Analysis Plan	Notes
No	1. How many years have you been practicing?	Report range and average years practicing	
No	2. How many obstetrical patients do you see in a week?	Report range and average number of patients seen	
No	3. Would you say that genetics and genomics is important in your scope of practice?	% who said yes vs. % who said no and comments	
No	4. Do you order genetic tests such as prenatal screening or prenatal diagnostic tests in your practice?	report % who said yes vs. % who said no and any comments	
No	5. In which region of Washington State do you predominantly practice?	list regions and how many respondents were from each region	
No	6. Is your clinic located in a more rural or urban area?	report % urban vs. % rural	
No	7. Approximately what percentage of your patients are non-native English speakers?	report range and average	

No	8. How would you rate your baseline prenatal genetic screening/testing knowledge?	report % of all responses	
No	9. What resources do you currently utilize for ordering and interpreting genetic tests?	report all resources	
No	10. How often do you refer a patient to genetic counseling when they ask questions regarding genetic diseases?*	report % of all responses	
No	11. a) Are there specific barriers you encounter when <b>deciding what prenatal genetic screening/diagnostic test(s) to order?</b>	report all barriers listed	
No	11. b) Are there specific barriers you encounter when interpreting prenatal genetic screening/diagnostic test results?	report all barriers listed	

No	11. c) Are there specific barriers you encounter when counseling your patients based on prenatal genetic screening/diagnostic test results?	report all barriers listed	
No	12. a) Are there specific barriers you encounter when deciding what prenatal carrier screening panel to order?	report all barriers listed	
No	12. b) Are there specific barriers you encounter when interpreting prenatal carrier screening results?	report all barriers listed	
No	12. c) Are there specific barriers you encounter when counseling your patients based on prenatal carrier screening results?	report all barriers listed	
No	13. Do you recommend carrier/prenatal screening to your prenatal and preconception patients?	report % of each response and comments	

No	14. Do you direct patients to any prenatal or preconception resources when they have questions regarding genetic testing or carrier screening?	report % yes vs % no and all resources	
No	15. Does the Carrier Screening Landing Page flow cohesively?	report % of each response and any comments	
No	16. Is there any information that could be added to the section titled "Current Carrier Screening Guidelines" on the Carrier Screening landing page?	report % of each response and any comments	
No	17. Does the Carrier Screening Fact Sheet flow cohesively?	report % of each response and any comments	

No	18. Is there anything from the section titled "Questions to ask your prenatal and preconception patients" in the Carrier Screening Fact Sheet that needs improvement?	report % of each response and any comments	
No	19. Is there anything from the Carrier Screening Decision Tree that needs improvement	report % of each response and any comments	
No	20. a) BEFORE reading this guidance, I felt ___ about ORDERING carrier screening for patients.*	report % of each response and any comments	
No	20. b) AFTER reading this guidance, I feel ___ about ORDERING carrier screening for patients.*	report % of each response and any comments	

Yes	20 a and b	use Wilcoxon signed rank test on paired samples to compare before and after	The Wilcoxon signed rank test on paired sample is a non-parametric alternative to the paired samples t-test for comparing paired data. This will be used since we are comparing before and after of the same sample. We want to compare the medians of paired samples. V-statistic is the sum of the positive ranks, the smaller V-statistic will be reported.
No	21. a) How confident were you in your ability to INTERPRET carrier screening results to patients BEFORE having this guidance?*	report % of each response and any comments	
No	21. b) How confident are you in your ability to INTERPRET carrier screening results to patients AFTER reading this guidance?*	report % of each response and any comments	

Yes	21 a and b	use Wilcoxon signed rank test on paired sample to compare	We want to compare the medians of paired samples. The smaller V-statistic will be reported.
No	22. Does the Prenatal Genetic Screening Landing Page flow cohesively?	report % of each response and any comments	
No	23. Do you think there is any information missing from the section titled "Conditions Detected by Prenatal Genetic Testing" on the Prenatal Screening landing page?	report % of each response and any comments	
No	24. Do you think there is any information missing from the section titled "Timeline of Prenatal Genetic Tests" on the Prenatal Screening landing page?	report % of each response and any comments	

No	25. Do you think there is any information missing from the “Insurance Frequently Asked Questions for Providers” section on the Prenatal Screening landing page?	report % of each response and any comments	
No	26. Do you think there is any information missing from the “CPT Codes and Billing” section on the Prenatal Screening landing page?	report % of each response and any comments	
No	27. Does the Aneuploidy Screening Fact Sheet flow cohesively?	report % of each response and any comments	
No	28. Do you think there is any information missing from the “Task Force Recommendations” section on the Aneuploidy Screening fact sheet?	report % of each response and any comments	

No	29. Is there anything from the Prenatal Aneuploidy Screening Detection Roadmap that can be improved?	report % of each response and any comments	
No	30. Was there any information from the Prenatal Aneuploidy Screening Bloodwork Screening Roadmap that you wish was included?	report % of each response and any comments	
No	31. Was there any information from the Prenatal Screening Positive cfDNA Flowchart that you wish was included?	report % of each response and any comments	
No	32. a) How would you rate your confidence in ORDERING prenatal genetic screening/testing for patients BEFORE this guidance?*	report % of each response and any comments	

No	32. b) How would you rate your confidence in ORDERING prenatal genetic screening/testing for patients AFTER this guidance?*	report % of each response and any comments	
Yes	32 a and b	use Wilcoxon signed rank test on paired sample to compare	We want to compare the medians of paired samples. The smaller V-statistic will be reported.
no	33. a) How confident were you in your ability to INTERPRET prenatal genetic screening/test results to patients BEFORE having this guidance?*	report % of each response and any comments	
no	33. b) How confident are you in your ability to INTERPRET prenatal genetic screening/test results to patients AFTER reading this guidance?*	report % of each response and any comments	
yes	33 a and b	use Wilcoxon signed rank test to compare	We want to compare the medians of paired samples. The smaller V-statistic will be reported.

yes	20 and 32	use Wilcoxon signed rank test on paired samples to compare	We want to compare the medians of the "after" results for each resource to see if people learned more from 1 resource. We want to compare the medians of paired samples. The smaller V-statistic will be reported.
yes	21 and 33	use Wilcoxon signed rank test on paired samples to compare	We want to compare the medians of the "after" results for each resource to see if people learned more from 1 resource. The smaller V-statistic will be reported.
no	34. Is the glossary easily accessible?	report % of each response and any comments	
no	35. Based on your patient population, what languages do you think would be most beneficial to have the glossary translated into?	report all languages and point out ones mentioned more than once	
no	36. Overall, how helpful do you find these resources?	report % of each response and any comments	

no	<p>37. Prior to this survey, were you aware that the Washington State DOH had created resources for prenatal providers ordering carrier screening and prenatal genetic screening? This includes all glossaries, clinical workflows, videos for patients, fact sheets, guidance, and insurance FAQ's for patients and providers.</p>	report % of each response and any comments	
no	<p>38. Do you feel that the information and resources provided met all needs?</p>	report % of each response and any comments	
no	<p>39. Is there anything you wish was included in this guidance that you think may be helpful?</p>	report % of each response and any comments	

no	40. Do you feel more confident knowing that these resources from the Washington State Department of Health are available for your use?	report % of each response and any comments	
no	41. Do you have any other feedback on anything else we have not addressed with these resources?	report any additional comments	
yes	1-7, 9, 11-12, 14-19, 22-31, 34-41	qualitative analysis-coding all written responses to find themes	use Theory of Planned Behavior and research questions for deductive codes

**Appendix D**

Question	Analysis			Notes	Completeness out of 37	Comments
1. How many years have you been practicing?	Range	Average	Max/Min		31	n/a
	38.5	12.98	40/1.5			
2. How many obstetrical patients do you see in a week?	Range	Average	Max/Min		31	n/a
	75.00	31.10	80/5			
3. Would you say that genetics and genomics is important in your scope of practice?	% yes	% no	% I prefer not to say	only 1 comment from someone who answered no, most who answered yes said they work in obstetrics or somehow with pregnant women and offer genetic counseling/screening	31	11
	90.32	9.68	0%			
4. Do you order genetic tests such as prenatal screening or prenatal diagnostic tests in your practice?	%yes	% no	% I prefer not to say	both comments from those who replied no- one is a hospitalist, and the other is only a laborist	31	2
	90.32	9.68	0%			
5. In which region of	Most Common Responses	Median Responses	Least Common Responses	those who picked	31	n/a

Washington State do you predominantly practice?	South= 11 = 35.48%	Seattle= 6 = 19.35%, NW= 7 = 22.58%	Southeast = 3 = 9.68%, multiple = 4 = 12.90%	multiple regions were not included in the count for any of the regions they chose, they were put into a separate category		
6. Is your clinic located in a more rural or urban area?	Urban	Rural	Other	1 "other" and write in response of 150,000 population	31	1
	29 = 93.55%	1 = 3.23%	1 = 3.23%			
7. Approximately what percentage of your patients are non-native English speakers?	Range	Average	Max/Min		31	n/a
	65	24.35	70/5			
8. How would you rate your baseline prenatal genetic screening/testing knowledge?	Most Reported	Least Reported	% Other Responses		26	0
	80.77% (21) = I regularly counsel patients on genetic screening and testing	3.85% (1) = I know the fundamental concepts	15.38% (4) = I am comfortable with the fundamental concepts			
9. What resources do you	Most Common Responses	Median Responses	Least Common Responses	40 % (10/25) of respondents	25	n/a

currently utilize for ordering and interpreting genetic tests?	self created resources/knowledge	ACOG, epic labs, LabCorp labs, literature/updates, known routine screening standards, and up to date	colleagues, genetic counselors, and MFM	utilize Genetic Counselors, 28% (7/25) of respondents use ACOG standards, literature and MFM were tied at 24% (6/25)		
10. How often do you refer a patient to genetic counseling when they ask questions regarding genetic diseases?*	Most Reported	Least Reported	% Other Responses	1 "other" response with a comment saying they do not order the tests	26	1
	57.69% (15) = sometimes	3.85% (1) = other	38.46% (10) = always			
11. a) Are there specific barriers you encounter when <b>deciding what prenatal genetic screening/diagnostic test(s) to order?</b>	Most Common Responses	Median Responses	Least Common Responses		26	n/a
	10 responses mentioned insurance coverage, approval, or pre-authorization; 5 people said no barriers,	2 people mentioned language barriers, 3 responses mentioned cost of testing, 3 responses mentioned patient education, literacy, or not knowing what tests they want, 2 people mentioned not knowing what to do with results or what tests to order, 2 responses said barriers are rare	1 response was about distance to experts/help, 1 response mentioned not having enough time to explain everything during appointments			

11. b) Are there specific barriers you encounter when interpreting prenatal genetic screening/ diagnostic test results?	Most Common Responses	Median Responses	Least Common Responses		26	n/a
	18 responses for no barriers	2 responses for very rare to encounter barriers	1 response for only being confident in interpreting common findings not rare diseases, 1 person had concerns for language and cost, 1 response for challenges with explaining false positives, 1 person responded with first part of integrated screening, 1 response for lack of knowledge, 1 response for elevated risks due to age			
11. c) Are there specific barriers you encounter when counseling your patients based on prenatal genetic screening/ diagnostic test results?	Most Common Responses	Median Responses	Least Common Responses		25	n/a
	11 responses for no barriers	4 responses related to health/medical literacy of patients/translators, 5 responses related to language barriers, 2 responses for time barriers	1 response for needing more knowledge on abnormal results, 1 response for explaining probability of false positives, 1 response for lack of confidence, 1 response for rare to			

			encounter barriers, 1 response for barrier in counseling specific tests			
12. a) Are there specific barriers you encounter when deciding what prenatal carrier screening panel to order?	Most Common Responses	Median Responses	Least Common Responses		26	n/a
	8 responses for no barriers, 8 responses regarding insurance coverage	3 responses for choosing tests/labs, 5 responses regarding cost	1 response for age, 2 responses regarding knowing full patient history, 1 response for time concerns			
12. b) Are there specific barriers you encounter when interpreting prenatal carrier screening results?	Most Common Responses	Median Responses	Least Common Responses		26	n/a
	21 responses for no (but lots of mention of help from GC)	3 responses for challenging results to interpret,	1 response for insurance coverage, 1 response for needing more expertise on certain topics			
12. c) Are there specific	Most Common Responses	Median Responses	Least Common Responses		25	n/a

barriers you encounter when counseling your patients based on prenatal carrier screening results?	15 responses for no barriers (sending to specialists/GC),	4 responses for health/genetic/medical literacy, 4 responses indicating language barriers, 2 responses for time concerns,	1 concern for access, 2 responses for conditions of tests/results, 1 response for cost and insurance coverage of tests, 1 response for health literacy/understanding penetrance			
13. Do you recommend carrier/prenatal screening to your prenatal and preconception patients?	% Responses	Most Common Responses	Least Common Responses	those who responded "always" clarified that they offer screening, 7 comments from those responded "sometimes," rarely response said insurance usually doesn't cover, prefer not to say was the person who is not in clinic	24	15
	62.5% (15) always, 29.17% (7) sometimes, 4.17% (1) rarely, 0% never, 4.17% (1) prefer not to say	6 responses clarifying that they offer screening not necessarily recommend,	2 concerns for insurance coverage, 2 responses for providing choices of tests to do based on patient history, 1 concern for time constraints, 1 response for not in clinic, 2 responses for only if patient is interested, and 1 response for briefly going over certain tests			
14. Do you direct patients to	% yes vs % no	Most Common Responses	Least Common Responses	17 comments from yes and 1 from no	26	18

any prenatal or preconception resources when they have questions regarding genetic testing or carrier screening?	88.46% (23) yes, 11.54% (3) no	6 responses mentioned referring patients to GC, 7 responses mentioned institutional resources,	2 responses mentioned DOH resources, 3 responses for referring to MFM, 3 responses mentioned ACOG, 1 response mentioned UW resources specifically			
15. Does the Carrier Screening Landing Page flow cohesively ?	% yes vs % no	Helpful	Not Helpful		23	2
	95.65% (22) yes, 4.35% (1) I prefer not to say	add more languages	haven't reviewed the resources			
16. Is there any information that could be added to the section titled "Current Carrier Screening Guidelines " on the Carrier Screening landing page?	% yes	% no	% I prefer not to say	2 people that voted yes commented concerns for cost and insurance coverage, 1 person who voted no commented that this section was straightforward and comprehensive, 1 person did not vote and commented that they haven't accessed the resources yet	22	4
	9.09% (2)	86.36% (19)	4.55% (1)			

17. Does the Carrier Screening Fact Sheet flow cohesively ?	% yes	% no	% I prefer not to say	the person who voted no said the orientation of the table should be changed so the boxes are not so narrow	24	1
	95.83% (23)	4.17% (1)	0%			
18. Is there anything from the section titled "Questions to ask your prenatal and preconception patients" in the Carrier Screening Fact Sheet that needs improvement?	% yes	% no	% I prefer not to say	1 comment from a yes vote asked for clear guidance on insurance coverage	24	1
	8.33% (2)	87.50 % (21)	4.17% (1)			
19. Is there anything from the Carrier Screening Decision Tree that needs improvement	% Responses	yes- comments	no- comments		22	2
	4.55% (1) yes, 90.91% (20) no, 4.55% (1) I prefer not to say	arrows cover text, concerns about order of testing and referring to GC	glad dissemination was included			
20. a) BEFORE	Most Reported	Least Reported	% Other Responses		24	0

reading this guidance, I felt ___ about ORDERING carrier screening for patients.*	45.83% (11) very confident	4.17% (1) less confident	37.50% (9) somewhat confident, 12.50% (3) neutral			
20. b) AFTER reading this guidance, I feel ___ about ORDERING carrier screening for patients.*	Most Reported	Least Reported	% Other Responses	1 comment stating the flow sheet and questions to ask are very helpful	24	1
	62.50% (15) more confident	0% less confident	37.50% (9) same as before			
20 a and b	V-statistic	p-value (95% CI)	Difference or no difference?	The Wilcoxon signed rank test on paired sample is a non-parametric alternative to the paired samples t-test for comparing paired data. This will be used since we are comparing before and after of the same sample. We want to compare the medians of paired	n/a	n/a
	27.5	0.005972 (0.1173, 2.0717)	Difference detected in medians before and after			

				samples. V-statistic is the sum of the positive ranks, the smaller V-statistic is reported.		
21. a) How confident were you in your ability to INTERPRET carrier screening results to patients BEFORE having this guidance? *	Most Reported	Least Reported	% Other Responses		24	0
	50% (12) somewhat confident	4.17% (1) not confident & 4.17% (1) neutral	41.67% (10) very confident			
21. b) How confident are you in your ability to INTERPRET carrier screening results to patients AFTER reading this guidance? *	Most Reported	Least Reported	% Other Responses	1 comment stated that they will continue to refer to GC as needed	24	1
	62.50% (15) same as before	37.50% (9) more confident	0% less confident			

21 a and b	V-statistic	p-value (95% CI)	Difference or no difference?	We want to compare the medians of paired samples.	n/a	n/a
	44	0.1198 (-0.8857, 0.7407)	No difference detected in the medians			
22. Does the Prenatal Genetic Screening Landing Page flow cohesively ?	% yes	% no	% I prefer not to say		23	0
	100% (23)	0%	0%			
23. Do you think there is any information missing from the section titled "Conditions Detected by Prenatal Genetic Testing" on the Prenatal Screening landing page?	% yes	% no	% I prefer not to say	1 comment said basic terms are missing	23	1
	4.35% (1)	95.65% (22)	0%			
24. Do you think there is any information missing from the section titled "Timeline	% yes	% no	% I prefer not to say		23	0
	0%	100% (23)	0%			

of Prenatal Genetic Tests” on the Prenatal Screening landing page?						
25. Do you think there is any information missing from the “Insurance Frequently Asked Questions for Providers” section on the Prenatal Screening landing page?	% yes	% no	% I prefer not to say	1 comment asked for cost estimates, 1 comment said insurance is constantly changing so things will constantly be missing, and title is worded oddly-suggested "Insurance related FAQ for providers"	22	3
	4.55% (1)	95.45% (21)	0%			
26. Do you think there is any information missing from the “CPT Codes and Billing” section on the Prenatal Screening landing page?	% yes	% no	% I prefer not to say	person who voted prefer not to say commented they do not know enough about coding and billing to answer	23	1
	0%	95.65% (22)	4.35% (1)			
27. Does the	% yes	% no	% I prefer not to say	no comments for why it	22	0

Aneuploidy Screening Fact Sheet flow cohesively ?	95.45% (21)	4.55% (1)	0%	does not flow cohesively		
28. Do you think there is any information missing from the "Task Force Recommendations" section on the Aneuploidy Screening fact sheet?	% yes	% no	% I prefer not to say	1 comment from someone who voted yes said that we are expecting too much of providers with the sentence that says ""Providers should review accuracy, false positive rates, and insurance coverage for..."	23	1
	8.7% (2)	91.30% (21)	0%			
29. Is there anything from the Prenatal Aneuploidy Screening Detection Roadmap that can be improved?	% yes	% no	% I prefer not to say	both comments from yes voters- 1 stated that recommending an early anatomy US at 12-14 weeks if pt declines all aneuploidy screening, should NT screening be offered? Other comment also	23	2
	8.7% (2)	91.30% (21)	0%			

				had to do with how the word offer is used and suggested all items be offered to not be assumed it needs to be done		
30. Was there any information from the Prenatal Aneuploidy Screening Bloodwork Screening Roadmap that you wish was included?	% yes	% no	% I prefer not to say	both comments from yes votes: confusing to follow and quad not really used in pts over 35 anymore	22	2
	9.09% (2)	90.91% (20)	0%			
31. Was there any information from the Prenatal Screening Positive cfDNA Flowchart that you wish was included?	% yes	% no	% I prefer not to say		23	0
	0%	100%	0%			
32. a) How would you	Most Reported	Least Reported	% Other Responses		23	0

rate your confidence in ORDERING prenatal genetic screening/testing for patients BEFORE this guidance? *	60.87% (14) very confident	0% neutral & not confident	39.13% (9) somewhat confident			
32. b) How would you rate your confidence in ORDERING prenatal genetic screening/testing for patients AFTER this guidance? *	Most Reported	Least Reported	% Other Responses		23	0
	60.87% (14) same as before	0% less confident	39.13% (9) more confident			
32 a and b	V-statistic	p-value (95% CI)	Difference or no difference?	We want to compare the medians of paired samples.	n/a	n/a
	82.5	0.3905 (-1.081, 1.681)	No difference detected in medians			
33. a) How confident were you in your ability to INTERPRET prenatal genetic screening/test results to patients BEFORE	Most Reported	Least Reported	% Other Responses		23	0
	47.83% (11) very confident	4.35% (1) not confident	39.13% (9) somewhat confident, 8.7% (2) neutral			

having this guidance? *						
33. b) How confident are you in your ability to INTERPRET prenatal genetic screening/ test results to patients AFTER reading this guidance? *	Most Reported	Least Reported	% Other Responses		23	0
	52.17% (12) same as before	0% less confident	47.83% (11) more confident,			
33 a and b	V-statistic	p-value (95% CI)	Difference or no difference?	We want to compare the medians of paired samples.	n/a	n/a
	52	0.04368 (-1.081, 1.681)	Difference detected in medians			
20 and 32	V-statistic	p-value (95% CI)	Difference or no difference?	We want to compare the medians of the "after" results for each resource to see if people learned more from 1 resource	n/a	n/a
	5	0.0595 (-0.390, 0.336)	No difference detected in medians			
21 and 33	V-statistic	p-value (95% CI)	Difference or no difference?	We want to compare the	n/a	n/a

	13.5	0.5297 (-0.2205, 0.2085)	No difference detected in medians	medians of the "after" results for each resource to see if people learned more from 1 resource		
34. Is the glossary easily accessible ?	% yes	% no	% I prefer not to say	comments said it was too hard to find, too many drop downs/clicks, would have never found it without the provided instructions	23	4
	78.26% (18)	21.74% (5)	0%			
35. Based on your patient population , what languages do you think would be most beneficial to have the glossary translated into?	Most Common Responses	Median Responses	Least Common Responses	2 responses mentioned just translating into the top 5 or 10 languages	23	n/a
	Dari was mentioned 6 times, mandarin was mentioned 7 times, Russian was mentioned 6 times, Somali was mentioned 5 times, 17 responses for Spanish	Amharic was mentioned 4 times, Arabic was mentioned 3 times, Pashto was mentioned 4 times, Ukrainian mentioned 3 times, Vietnamese mentioned 4 times	afghani, Cantonese, Portuguese, and Urdu all mentioned once and Punjabi only twice			
36. Overall, how helpful do you find these resources?	Most Reported	Least Reported	% Other Responses	1 comment stating, "This is an excellent, comprehensive repository of information	23	1
	91.30% (21) very helpful	0% not helpful	8.7% (2) neutral			

				surrounding genetic testing."		
37. Prior to this survey, were you aware that the Washington State DOH had created resources for prenatal providers ordering carrier screening and prenatal genetic screening? This includes all glossaries, clinical workflows, videos for patients, fact sheets, guidance, and insurance FAQ's for patients and providers.	% yes	% no	% I prefer not to say	1 comment said they knew of some resources, 1 comment said they knew of the resources but did not have time to look them over, 1 comment said they're sure they've heard of the resources but never had time to look them over before being asked to do this survey	23	3
	26.09% (6)	73.91% (17)	0%			

38. Do you feel that the information and resources provided met all needs?	% yes	% no	% I prefer not to say	comment specified that there are little things needing improvement	23	1
	100% (23)	0%	0%			
39. Is there anything you wish was included in this guidance that you think may be helpful?	% yes	% no	% i prefer not to say	some suggestions to improve these resources are adding cost estimates, screening in twins, and more considerations around maternal age	23	3
	8.7% (2)	91.30% (21)	0%			
40. Do you feel more confident knowing that these resources from the Washington State Department of Health are available for your use?	% yes	% no	% I prefer not to say		23	0
	95.65% (22)	4.35% (1)	0%			
41. Do you have any other	Most Common Responses	Median Responses	Least Common Responses		8	n/a

<p>feedback on anything else we have not addressed with these resources?</p>	<p>4 responses said no other feedback</p>	<p>2 responses said they wish they knew about these resources earlier- 1 person suggested sending out an email or some sort of advertisement for them</p>	<p>1 said they will encourage other providers and patients to visit these resources, 1 other response said there are time constraints for providers who see a large volume of patients and they said a provider might be overwhelmed with all the available info- they suggest creating an abridge short version and making flow charts front and center since they are more likely to be used</p>			
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