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stopped developing; and infertility. People with PCOS may also have metabolic issues, such as insulin resistance or obesity. PCOS is a set of symptoms can include menstrual irregularities, cardiovascular issues, acne, insulin resistance, and obstructive sleep apnea. More >> Research shows that genetic and environmental factors contribute to the development of PCOS; the exact cause of PCOS remains unknown. More >> Health care providers look for two or more features absence of ovulation, resulting in light or skipped periods; high androgen levels; and follicle growths in one or both ovariesto diagnose PCOS. More >> Treatments for PCOS, its specific symptoms, and its associated health problems vary, but they may include lifestyle changes, medications, and ways to remove or otherwise address increased hair growth. More >> NICHD research explores causes, predictors, treatments, and other topics related to PCOS. More >> NICHD research explores causes, predictors, treatments, and other topics related to PCOS. More >> NICHD research explores causes, predictors, treatments, and other topics related to PCOS. More >> NICHD research explores causes, predictors, treatments for PCOS. conducts and supports a variety of clinical research projects related to PCOS. More >> Find answers to other frequently asked questions related to PCOS. More >> Teede, H. J., Tay, C. T., Laven, J. J. E., Dokras, A., Moran, L. J., Piltonen, T. T., Costello, M. F., Boivin, J., Redman, L. M., Boyle, J. A., Norman, R. J., Mousa, A., & Joham, A. E. (2023). Recommendations from the 2023 international evidence-based guideline for the assessment and management of polycystic ovary syndrome. The Journal of Clinical Endocrinology and Metabolism, 108(10), 24472469. PMID: 37580314American College of Obstetricians and Gynecologists. (2022) FAQs: Polycystic ovary syndrome (PCOS). Retrieved July 26, 2024, from Badawy, A., & Elnashar, A. 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PMID: 17287476Barbieri R. L. (2003). Metformin for the treatments for polycystic ovary syndrome. American Family Physician, 79(8), 671676. PMID: 19405411Martin, K. A., Anderson, R. R., Chang R. J., Ehrmann, D. A., Lobo, R. A., Murad, M. H., Pugeat, M. M., & Rosenfield, R. L. (2018). Evaluation and treatment of hirsutism in premenopausal women: An Endocrine Society Clinical Practice guideline. The Journal of Clinical Endocrinology and Metabolism, 103(4), 12331257. PMID: 29522147Kumar, A., Naguib, Y. W., Shi, Y. C., & Cui, Z. (2016). A method to improve the efficacy of topical efformithine hydrochloride cream, Drug Delivery, 23(5), 14951501. PMID: 25182303U.S. Food and Drug Administration. (2000). VANIQA (efformithine hydrochloride) cream, 13.9%. Retrieved July 26, 2024, from (PDF 236 KB) Because symptoms of PCOS can differ widely, researchers and health care providers focus on specific features to diagnose the condition. There are currently different approaches to diagnosing PCOS, but most require two of the following features: Absence of or irregular ovulation, resulting in menstrual irregularities such as light periods or skipped periods. conditions, or signs of high androgens, such as increased body or facial hairGrowths of a specific size in one or both of the ovaries, often clumps of ovarian follicles that have stopped developing, as detected by ultrasoundOne diagnostic. The third approach requires feature 1, plus 2 or 3. Please note that current diagnostic guidelines apply to adults. There are currently no diagnostic griteria for PCOS in they have some of its characteristic features, so the health care provider can reevaluate their symptoms and health later in life.1, 2 Researchers are also exploring whether women with PCOS have detectable markers of the condition in childhood and the teen years, to better pinpoint diagnosis and improve care. Teede, H. J., Tay, C. T., Laven, J. J. Redman, L. M., Boyle, J. A., Norman, R. J., Mousa, A., & Joham, A. E. (2023). Recommendations from the 2023 international evidence-based guideline for the assessment and management of polycystic ovary syndrome. The Journal of Clinical Endocrinology and Metabolism, 108(10), 24472469. PMID: 37580314Pal, L. (2019). Polycystic Ovary Syndrome in Adolescents [Webinar]. American Society for Reproductive Medicine Grand Rounds Webinar Series in Reproductive Endocrinology and Infertility. Retrieved on July 26, 2024, from Because the characteristic features of PCOSabsence of ovulation, indicated by irregular menstrual periods at all; high androgen levels; and growths in one or both ovaries, often clumps of ovarian follicles that have stopped developingare wide ranging, so, too, are the symptoms of the condition. Often, women and health care providers may not suspect PCOS because the symptoms may seem unrelated. These can include:1,2Menstrual irregularities:No menstrual periodscalled amenorrheaSkipped periodscalled oligomenorrheaVery heavy periodsBleeding but no ovulationcalled anovulatory periodsInfertilityIncreased hair growth on the face, chest, belly, or upper thighsa condition called hirsutismSevere, late-onset, or persistent acne that does not respond well to common treatmentsInsulin sensitivityObesity, weight gain, or trouble losing weight, especially around the waistOily skinPatches of thickened, dark, velvety skina condition called acanthosis nigricansFor many adolescents, these symptoms may also be part of puberty, especially early in the process. A health care provider may consider PCOS treatments for severe symptoms even without a diagnosis of PCOS.3Because many women don't consider only skin, increased hair growth, or acne to be symptoms of a serious health condition, they may not mention these things to their health care providers. As a result, many women aren't diagnosed with PCOS until they have trouble getting pregnant, or until they have menstrual irregularities. Although PCOS is a leading cause of infertility, many women of reproductive age with PCOS can and do get pregnant. Pregnant women who have PCOS, however, are at higher risk for certain problems, such as miscarriage. Learn more about PCOS-related pregnancy problems. Women with PCOS are also at higher risk for the following health issues Endometrial hyperplasia, a condition in which the lining of the uterus becomes too thick, and endometrial cancer, also called uterine cancerInsulin resistance, when the body doesnt use insulin wellToo much glucose and insulin in the blood can contribute to metabolic syndrome and type 2 diabetes. More than one-half of women with PCOS have insulin resistance. 6Patches of thickened, dark, velvety skin, called acanthosis nigricans, are associated with insulin resistance. Metabolic syndrome, a group of risk factor for many health problems, including diabetes, heart disease, high blood pressure, and sleep apnea. About 4 out of 5 women with PCOS also have obesity. 50bstructive sleep apnea than others, including those without PCOS and those with obesity.9Type 2 diabetes also increases the risk for heart disease and high blood pressure. More than one-half of women with PCOS will have either type 2 diabetes or prediabetes before their early 40s.11Just because a woman is diagnosed with PCOS does not mean she will experience all these issues as part of her regular care. American College of Obstetricians and Gynecologists. (2022) FAQs: Polycystic ovary syndrome (PCOS). Retrieved July 26, 2024, from Office on Womens Health. Polycystic ovary syndrome. Retrieved July 26, 2024, from Committee on Adolescent Health. Polycystic ovary syndrome. Retrieved July 26, 2024, from National Heart, Lung, and Blood Institute (NHLBI). The Heart Truth. 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Clinical Obstetrics and Gynecology, 50(1), 226243. PMID: 17304038 PCOS is a set of symptoms related to a hormonal imbalance. These symptoms can include changes in metabolism, menstrual and reproductive health, and heart and blood function, as well as inflammatory responses and other outward characteristics. What is PCOS?PCOS is a set of symptoms related to a hormonal imbalance. Women with PCOS usually have at least two of the following three features: 1 Absence of ovulation (when the ovary releases a mature egg into the fallopian tube, usually monthly), leading to irregular menstrual periods or no periods at allHigh levels of hormones called androgens, or signs of high androgens, such as increased body or facial hairGrowths in one or both ovaries, often clumps of ovarian follicles that have stopped developing 2Some women diagnosed with PCOS have the first two features, as well as symptoms of PCOS, but do not have growths in their ovaries. More recent genetic research suggests there may be two or more subtypes of PCOS defined by a set of genes or changes in specific genes. 3PCOS is the most common cause of anovulatory infertility, meaning that the infertility results from the absence of ovulation. Many women don't find out that they have PCOS until they have trouble getting pregnant. Women with PCOS may experience a range of symptoms that may seem unrelated to ovaries. For example, increased hair growth, dark patches of Skin, acne, insulin resistance, and irregular menstrual bleeding are all possible symptoms of PCOS. American College of Obstetricians and Gynecologists. (2022) FAQs: Polycystic ovary syndrome (PCOS). Retrieved July 26, 2024, from International evidence-based guideline for the assessment and management of polycystic ovary syndrome. Monash University, Melbourne, Australia, 2018. Retrieved July 26, 2024, (PDF 1.42 MB)Dapas, M., Lin, F. T. J., Nadkarni, G. N., Sisk, R., Legro, R. S., Urbanek, M., Hayes, M. G., & Dunaif, A. (2020). Distinct subtypes of polycystic ovary syndrome with novel genetic associations: An unsupervised, phenotypic clustering analysis. PLOS Medicine, 17(6), PMID: 32574161 Fertility problems related to PCOS. However, anovulation may not be the only factor in these problems. Before beginning treatment for infertility possibly related to PCOS, work with your health care provider to rule out other causes. 1 Losing weight and other lifestyle changes can help restore ovulation and improve pregnancy rates among women with PCOS.3,4 Among women with PCOS who have obesity and who experienced menstrual dysfunction, losing even a small amount of weight improved menstrual function and fertility. 5Health care providers may also recommend one or more of the following treatments to improve fertility in women with PCOS. This drug is the most common treatment for infertility in women with PCOS.1 The American College of Obstetricians and Gynecologists (ACOG) recommends clomiphene as the primary medication for women with PCOS-related infertility. It is also U.S. Food and Drug Administration (FDA) approved for treating PCOS-related infertility. indirectly causes eggs to mature and be released. 7Research shows that women who conceive with the aid of clomiphene are slightly more likely to have multiples, most commonly twins. 8 Metforminan insulin-sensitizing agentcan be used alone or with clomiphene when clomiphene alone is not successful to spur or regulate ovulation in women with PCOS.2, 3Evidence shows that metformin, alone and in combination with clomiphene, improves ovulation, but it does not increase the rate of pregnancy. 10Metformin is not FDA approved for treating PCOS-related infertility. This drug briefly slows estrogen production and causes the body to make more follicle-stimulating hormone (FSH), a hormone needed for ovulation.11An NICHD-supported study found that letrozole was more effective than clomiphene in causing ovulation and improving live-birth rates for women with PCOS.12Studies of letrozole in animal models have shown that it causes congenital anomalies if used during pregnancy, but there have been no studies of this drug in pregnant women.11, 13 These hormones, given as shots, cause ovulation. This treatment has a higher risk of multiple pregnancies than treatment with clomiphene. 4Your health care provider may use frequent laboratory tests and ultrasound exams to monitor how your body responds to this treatment. 4 Because the benefits of this surgery, by itself or in addition to medication treatment, for increasing the chance of ovulation 14 is unclear, it is not recommended by all health care provider groups. It may be considered if lifestyle changes and medications are unsuccessful and often in combination with other treatments. In ovarian drilling, the surgeon makes a small cut in the abdomen and inserts a long, thin tool called a laparoscope. The surgeon then uses a needle with electric current to puncture and destroy a small part of the ovary. The surgery may lead to lower androgen levels, which may improve ovulation. However, it does not seem to increase the risk of multiple pregnancies.15 However, it does carry the risk of scarring the ovaries.8If these treatments are not successful, your health care provider may suggest in vitro fertilization (IVF), or another type of assisted reproductive technology (ART).16 IVF may offer the best chance of pregnancy for women with PCOS. Different types of ART have their own risks and benefits. You should discuss all the options thoroughly with your health care provider before deciding. American Society for Reproductive Medicine. (n.d.). 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Retrieved July 26, 2024, from Alphabetical lists of links to external organizations and information included on this page do not indicate endorsement from NICHD, NIH, or HHS.NICHD ResourcesDevelopmental Endocrine Oncology Affinity GroupThis group includes researchers who are working to advance our understanding of endocrine, genetic, and metabolic disorders and endocrine tumors that impair human development, causing disease and disability. Fertility and Infertility, uncovering new possible pathways to control fertility, and expanding fundamental knowledge of processes that underlie human reproduction. Gynecologic Health and Disease Branch (GHDB)GHDB works to improve womens reproductive health by guiding and supporting gynecologic research, including studies of healthy functioning endometrium and typical menstruation and menstrual problems and pain, especially related to gynecologic disorders such as PCOS. Polycystic Ovary Syndrome (PCOS) and Women's HealthLearn about NICHD support of research on PCOS and women's health, and review some recent advances in understanding, diagnosing, and treating this condition. Other Resources American College of Obstetricians and Gynecologists (ACOG) ACOG is the nation's leading association for professionals who provide health care for women. American Society for Reproductive Medicine (ASRM) ASRM is a leader in providing multidisciplinary information, education, advocacy, and standards in the field of reproductive medicine. Centers for Disease Control and Prevention (CDC) CDC studies issues related to infertility and publishes an annual report on success rates for assisted reproductive technology, including information about individual fertility clinics in the United States. Assisted Reproductive Technology is a leading source of hormone-related health information for the public, health care providers, and the media: Polycystic Ovary Syndrome (PCOS). Monash University PCOS Program This Australian-based university leads a Center of Excellence on PCOS and coordinates internationally approved guidelines for the diagnosis and treatment of PCOS, as well as the AskPCOS mobile app, which provides evidence-based information about PCOS for patients. National Library of Medicine (NLM) MedlinePlus, produced by the NLM, is the NIH website for patients. It features information about diseases, conditions, and wellness issues in plain language: Polycystic Ovary Syndrome (Spanish version). Office on Women's HealthPart of HHS, the Office of Women's Health coordinates services and activities related to women's health: Polycystic Ovary Syndrome (PCOS) Fact Sheet (PDF 126 KB). PCOS Awareness Association (PCOSAA) PCOSAA works to raise global awareness of PCOS, assist those diagnosed with the condition and its related health complications, and increase understanding of the conditions complexities. PCOS Challenge: The National Polycystic Ovary Syndrome Association PCOS Challenge helps adults and adolescents affected by PCOS manage their health better and reduce their risk for life-threatening related diseases through multimedia educational programming, live events, support groups, grants, health screenings, and advocacy and awareness initiatives. Some PCOS Challenge programs and resources include: RESOLVE: The National Infertility. Society for Assisted Reproductive Technology (SART) SART is an organization of professionals dedicated to assisted reproductive technology (ART), which includes in vitro fertilization. Read SART'spatient guide to ART. Treatments for PCOS, its specific symptoms, and its associated health problems vary, but they may include medications, lifestyle changes, and ways to address increased hair growth and acne. Because PCOS has a broad range of symptoms, health care providers may use a variety of treatments for PCOS symptoms can prevent acne. Because PCOS has a broad range of symptoms, health care providers may use a variety of treatments for PCOS symptoms can prevent pregnancy or may harm the fetus during pregnancy, it's important to discuss your fertility goals with your health care provider when discussing treatment options. Be sure you fully understand your treatment options and their effects, some of them serious. You should discuss the risks and possible side effects of treatments with your health care provider. Because some lifestyle choices, such as smoking cigarettes, can increase these risks, you should discuss all these factors with your health care provider before making decisions about treatments. Many of the treatments discussed are not approved by the U.S. Food and Drug Administration (FDA) specifically for treating PCOS, meaning they cannot cure or prevent the condition. However, your health care provider may recommend them to treat symptoms of PCOS, such as acne and irregular periods. The following information describes available treatments for different symptoms of PCOS, such as acne and irregular periods. PCOS. You can also review the treatment options for infertility related to PCOS as symptoms and related health issues, especially cardiovascular risks. 2Weight loss can restore ovulation and help make menstrual cycles more regular, which can improve chances of pregnancy and overall health.2,3Losing weight can improve both insulin and cholesterol levels.2,4For many women with PCOS, weight loss also reduces symptoms such as increased hair growth and acne.2,5Physical activity can help reduce depression associated with PCOS.6Adjusting your diet to reduce foods that can cause or increase inflammation could also be beneficial. Talk to your health care provider about designing a diet and physical activity plan just for you. Also called birth control pills or the pill, oral contraceptives containing the hormones estrogen and progestin are the primary long-term treatment option for women with intact ovaries who have PCOS but do not wish to become pregnant. In women with PCOS, these hormones: 2Make menstrual periods more regular Reduce the level of androgens, leading to lower and reduce increased hair growth Oral contraceptives can help lower the risk of certain types of cancers, but they may also raise the risk of other types of cancers.8 There is no one oral contraceptive that works best for women with PCOS. However, some pills contain progestin, and some types of progestin have androgenic side effects, such as oily skin, acne, and increased hair growth. For this reason, birth control pills that contain a lowandrogenic progestin that does not activate these side effects are more effective at treating the symptoms of PCOS. These types of medications make the body more responsive to insulin and keep glucose levels more stable.2,10 In women with PCOS, these medications can help: Clear acne and reduce hair growth Improve weight loss Lower cholesterol levelsMake periods more regularSlightly reduce infertility associated with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, women with PCOS who have ovaries may start ovulating naturally.12Insulin-sensitizing medications, which is a start ovulating naturally and the properties of the properties over the properties of the properties over the propert provider about any concerns you may have about these medications. 13 These medications either prevent the body from making androgens or limit the activities or effects of those hormones. In women with PCOS, anti-androgens can: Lower androgens can: Lower androge often taken with oral contraceptives to prevent pregnancy.14 Be sure to talk with your health care provider about the risks of these treatments, especially if you want to become pregnant. Anti-androgen for treating PCOS symptoms is not known. Those who wish to remove or otherwise address unwanted hair or increased growth for personal aesthetic reasons can use the following methods instead of or in combination with other approaches:13Daily application of an eflornithine cream slows hair growth, especially on the face, by blocking an enzyme hair needs to growth for personal aesthetic reasons can use the following methods instead of or in combination with other approaches:13Daily application of an eflornithine cream slows hair growth, especially on the face, by blocking an enzyme hair needs to grow an enzyme The hair will grow back when use of the cream stops, so those interested should talk with a health care provider about a long-term management plan. Eflornithine is FDA approved for the treatment of unwanted facial hair, but no studies have been published about its use specifically in women with PCOS.13Some studies in animal models suggest that combining the cream use with mechanical methods, such as microneedles, may improve outcomes. 15 Pregnant women should not use this cream because it can cause harm to a fetus. Talk to your health care provider about risks, benefits, and your fertility goals before using the cream. 16 Mechanical methods, such as shaving, bleaching, plucking, waxing, and using depilatories (creams that dissolve hair), are also effective at temporarily removing or hiding unwanted hair. Some of these methods, such as shaving and plucking, are associated with skin irritation and the development of ingrown hairs. Similarly, some depilatories can cause irritation and rashes. Electrolysis, lasers, and intense pulsed light (IPL) therapy are options for permanent or long-term hair removal. These treatments may require multiple sessions to remove hair. 2 Electrolysis uses an electric current applied to each hair follicle. IPL therapy uses an intense flash of light in a specific wavelength to target the melanin, or color, in hair to destroy the hair follicle. Retinoids, antibacterial agents, and antibiotics are common ways to treat acne; the specific treatment recommended depends on the severity of the acne. The treatments come in a variety of forms, such as pills, creams, or gels, and in different strengths; higher strength options may require a prescription. Because retinoids can cause congenital anomalies, those who are or wish to become pregnant should not use the treatments. 2 Teede, H. J., Tay, C. T., Laven, J. J. E., Dokras, A., & Joham, A. E. (2023) Recommendations from the 2023 international evidence-based guideline for the assessment and management of polycystic ovary syndrome. The Journal of Clinical Endocrinology and Metabolism, 108(10), 24472469. 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VANIQA (eflornithine hydrochloride) cream, 13.9%. Retrieved July 26, 2024, from (PDF 236 KB) Research has shown that genetic and environmental factors contribute to the development of PCOS, but its exact cause remains unknown. The symptoms of PCOS tend to run in families, so genetics have long been a focus of PCOS research. Recent research suggests that there are 19 possible changes, or variants, in genes that can increase a persons risk of developing PCOS. 1 These variants could explain why the features and symptoms of PCOS are so different from one person to the next. Although PCOS usually is considered to be a condition related to the ovaries, researchers found these genetic variants in both females and males. In fact, males with these genetic variants experienced by females with PCOS.2Researchers identified two subtypes: reproductive, which has higher reproductive hormone levels; and metabolic, which has higher Body Mass Index (BMI), insulin, and glucose levels. 30ther NICHD-funded work found four subtypes, 4 which has higher BMI, insulin, and glucose levels. the hormonal/menstrual cycle changes cluster had increased age at first menstruation; the blood markers, including platelets; and the metabolic changes cluster had decreased blood markers, including platelets; and the metabolic changes cluster had increased levels of androgen hormones in the womb may also increase the likelihood of PCOS in offspring.5,6What causes the symptoms of PCOS? Many symptoms of PCOS? many symptoms of PCOS? and adrenal glands produce reproductive hormones that are involved in regulating reproductive processes and health. One reproductive hormone, called estrogen, plays a role in regulating the menstrual cycle, breast health, bone development, and other important functions. Another such hormone, called androgen, contributes to hair growth, muscle development, sperm production (in males), and voice deepening. 8Women with PCOS have higher levels of androgens and may have lower levels of androgens and may have lower levels of androgens can interfere with signals from the brain that control ovulation, making it occur sporadically or not at all. High androgen levels can also cause ovarian folliclessmall, fluid-filled sacs where eggs grow and matureto stop developing and clump together.9,10 Androgen levels also play a role in increased hair growth and acne.10Many women with PCOS also have problems with another hormone called insulin, which helps move sugar (also called glucose) from the bloodstream into cells to use as energy. When cells don't respond normally to insulin, the level of sugar in the blood rises. High insulin levels are linked to a skin condition called acanthosis nigricans, which results in thickened dark, velvety patches of skin.10In addition, the body makes more and more insulin, the body makes more and more insulin to get glucose into the cells. To balance out the high levels of insulin, the body makes more and more insulin to get glucose into the cells. To balance out the high levels of insulin, the body makes more and more insulin to get glucose into the cells. To balance out the high levels of insulin, the body makes more and more insulin to get glucose into the cells. To balance out the high levels of insulin, the body makes more and more insulin to get glucose into the cells. this cycle, which is why treating PCOS can be challenging. Welt C. K. (2021). Genetics of polycystic ovary syndrome: What is new? Endocrinology and Metabolism Clinics of North America, 50(1), 7182. 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PCOS is a set of symptoms related to a hormonal imbalance. Symptoms can affect metabolic, cardiovascular, inflammatory, reproductive, and other aspects of health. PCOS may cause menstrual cycle changes; skin changes such as increased facial and body hair and acne; growths in one or both ovaries, often clumps of ovarian follicles that have

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