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Guide to Pregnancy and Work

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Foreword

This *Guide to Pregnancy and Work* has been produced by the Australasian Faculty of Occupational & Environmental Medicine (AFOEM) of The Royal Australasian College of Physicians (RACP) to provide general information and advice regarding workplace pregnancy issues for pregnant women in the workplace, women of reproductive capacity who are at work, employers, post-partum employees and health professionals. This Guide is not intended to be a substitute for specific advice for women of reproductive capacity, pregnant employees, or post-partum employees, from their general practitioner, gynaecologist, obstetrician or other relevant health practitioner. As far as possible, the information outlined in this Guide is based on the best available evidence at the time of writing. Where no evidence or data is available the information has been based on guidelines and best practice from expert organisations which are referenced throughout.

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- The Paediatric and Child Health Division (PCHD), RACP
- The Australian Society for Infectious Diseases (ASID)
- The Internal Medicine Society of Australia and New Zealand (IMSANZ)
- The Society of Obstetric Medicine of Australia and New Zealand (SOMANZ)
- The Australian Physiotherapists Association (APA)
- The College of Nurses Aotearoa (NZ)
- The New Zealand Nurses Organisation (NZNO)
- The Royal New Zealand College of General Practitioners (RNZCGP)
- The Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG)
- The Royal Australian and New Zealand College of Psychiatrists (RANZCP)

Introduction

Pregnancy is a normal physiological state during which time most women enjoy good health. These normal physiological changes however can at times affect the mother's ability to undertake some of her workplace tasks as the pregnancy progresses. In addition, while pregnancy is a normal process and most women are at low risk of adverse effects, these risks are not zero compared to people who are not pregnant.

Furthermore, while the hazards and risks for a given worker at a workplace may not be of scientific or medical significance, people may consider their work as a significant threat to their ability to have normal healthy babies. Any policy must consider the social or cultural factors that underpin these beliefs. Those employees who wish to become pregnant, or who are already pregnant and have concerns must have those concerns adequately addressed regardless of the actual level of risk. Also, the developing fetus may be at increased risk of harm from some otherwise safely-managed workplace hazards, or issues in the workplace that are not hazardous to an adult. Workplaces should address all of these concerns in order to support their pregnant employees and to meet their occupational health and safety and anti-discrimination obligations.

Key points

1. Although pregnant women may have special needs in the workplace, pregnancy is not an illness and should not be treated as one.
2. Pregnancy is a basic human right and should be supported unequivocally by the community.
3. Employers should develop and implement policies and procedures regarding pregnancy at work that are non-discriminatory, flexible and comply with relevant legislation.
4. This Guide does not, and cannot, provide a comprehensive list of hazards to pregnant women and employers.

General principles

Women with uncomplicated pregnancies benefit from remaining at work and being physically active. The key purpose of this Guide is to provide information to enable women of reproductive capacity to remain successfully integrated into the workplace prior to becoming pregnant and once they become pregnant to assist in their subsequent return to work. This purpose is based on the following general principles:

- Long term work absence, work disability and unemployment can have a negative impact on health and wellbeing.
- The provision of good work is a key determinant of health and wellbeing of employees, their families and broader society.
- Good work is engaging, fair, respectful and balances job demands, autonomy and job security.
- Good work respects the importance of culture and traditional beliefs. It is characterised by safe and healthy work practices and strikes a balance between the interests of individuals, employers and society.
- Each woman will require individualised assessment, especially for complex cases or for workplaces or work tasks that have specific hazards (e.g. hazardous substances, radiation), or safety critical work.
- Employers should develop a pregnancy policy specific for their workplace and work tasks. The specific component/requirements of the policy may therefore vary for different employers/workplaces, or different roles in the same workplace.
- Depending upon the work tasks and/or workplace, employers may need specialised assistance in developing appropriate workplace policy and procedures regarding pregnancy and work.[1]
- Important considerations when developing a policy include privacy and confidentiality of medical information, and balancing occupational health and safety obligations with anti-discrimination legislative requirements.
- The policy should address post-partum return to work, the provision of suitable duties during pregnancy and, where possible, accommodate breast feeding and/or expressing of breast milk.

[1] *Note: Please refer to Appendix 5 for a list of useful resources.*

- It is important for women of reproductive capacity in general, and women who become pregnant in particular, to be aware of their workplace's pregnancy-specific policies. Ideally, an employee should seek personalised health advice from appropriate health professionals before becoming pregnant, and as her pregnancy progresses. In some cases it may be appropriate for the employee to discuss these issues with her employer with careful consideration of the employee's privacy and right to medical confidentiality.

This Guide provides information to:

- Assist employees to recognise early warning signs that physical activity may be too strenuous.
- Educate the mother to be of the potential impacts of her work on her and her fetus during each of the three trimesters of a normal pregnancy; and
- Advise on potential workplace hazards, risk assessment and risk control including:
  - Ergonomic, physical, chemical, biological and psychological hazards
  - Issues of complicated pregnancies
  - Return to work after childbirth
  - Breastfeeding at work
  - Equal opportunity issues around pregnancy and work.

What are the benefits of a pregnancy friendly workplace?

In addition to meeting legal obligations, the benefits to organisations that are pregnancy friendly include:

- Supporting healthy pregnancies and healthy babies
- Engaging and supporting women of reproductive capacity which improves productivity in the longer term
- Retaining talented and skilled staff
- Reducing absenteeism and the effects of presenteeism throughout pregnancy
- Raising awareness and actively addressing workplace health risks to employees
- Facilitating return to work following pregnancy/parental leave
- Promoting healthier lifestyle choices in the long term.

Advice for pregnant employees

Although working while pregnant will usually require some adjustments, safe work is possible for the vast majority of women. It is important for employees of reproductive capacity in general, and employees who become pregnant in particular, to be aware of their workplace pregnancy-specific policies. Pregnant employees should ascertain whether their employer offers any special programs, services, leave or other benefits that they may be able to utilise.

Most employees are not obligated to inform their workplace of their pregnancy except when applying for maternity leave. However, once a woman knows she is pregnant, early engagement with her employer, if possible, makes it easier for them both to manage the balance between the pregnancy and safe work. If revealing a pregnancy is likely to have adverse effects on a pregnant employee she should consider carefully whether to reveal her pregnancy or not. It will, of course, become evident at some time unless other events occur such as a termination or miscarriage, but the decision to reveal a pregnancy in the absence of specific workplace requirements is entirely up to the woman in question.

In some safety critical industries such as commercial diving, emergency and fire services, the armed forces and the aviation industry, employees are required to notify their employer as soon as they know they are pregnant. This is to ensure their own and their fetus' safety, and in some cases that of other employees and the general public.

Under some circumstances it may not be possible for pregnant women to continue working or to work specific shifts while they are pregnant, for example, if:

- There are serious risks at work such as certain kinds of chemical hazards
- They have had a difficult pregnancy in the past or
- There are complications with their current pregnancy
- Or if there are regulatory reguirements

Even in such circumstances it may still be possible to modify their employment in order to reduce the risks, by working from home or working at a different section of the same employer for example. In order to do so in as safe a manner as possible pregnant employees need to be aware of the relevant workplace hazards and discuss those with their supervisor and doctor. Ceasing work altogether should be considered an option of last resort based upon medical *and* workplace advice.

At times workers may ask, individually or through a collective group such as a union or speciality association, about the risks of a specific workplace agent or condition. At such times, a review of the available literature and an open discussion with a medical or allied health professional may be sufficient to answer these questions. At other times, a more in depth investigation including work site inspections may be necessary.

In general a healthy woman with an uncomplicated pregnancy may continue to work with minimal interruption throughout her pregnancy.

First trimester - One to 13 Weeks

A healthy first trimester is crucial for the normal development of the fetus as this is when the major body organs and systems begin to form. Because a woman may not know she is pregnant, this is also the period of greatest risk to the fetus. **This is the single most important reason for employers to have pregnancy-related policies and procedures to support the health and well-being of their employees with reproductive capacity.**

The pregnancy may be planned or unplanned and the pregnant employee may be considering whether to proceed with, or terminate, the pregnancy. Workplaces may have to consider and allow for these emotional stresses as well as the other direct physical and psychological stresses of early pregnancy.

During the first trimester many pregnant women experience fatigue, nausea and sometimes vomiting, while other women have no problems whatsoever. Although most women maintain normal cognitive functioning in pregnancy it can be adversely affected by stress, sleep disturbance, concurrent biological and/or mental health issues. Some pregnant women describe difficulties with memory and

concentration. Pregnant employees who experience 'morning sickness' may need to take some sick leave during the first three months of pregnancy, or they may choose to remain at work if the business can accommodate changes to the work roster or task allocation. For example, they may require a later start, alternate duties or changes in the scheduling of their breaks.

Second trimester – 14 to 27 Weeks

During the second trimester, the fetus increases in size as its organs and systems continue to develop. Many pregnant women during this time experience feelings of wellbeing, though they also have to contend with physical changes such as:

- Increasing weight, concentrated around the abdomen and pelvis
- A shift in their centre of gravity forward as they gain weight
- Postural changes as they gain weight, in particular to the curvature of the lower back
- Increased blood volume and cardiac output (the amount of blood pumped by the heart)
- Increasing volume and frequency of urination, which may require frequent toilet breaks.

Back, pelvic girdle and other muscular pains are common in the second trimester. The heart has a reduced capacity to adapt to exertion and there is increased pressure in the lower leg veins. These changes may affect the work capacity of the employees as follows:

- Prolonged standing becomes progressively more difficult and uncomfortable;
- Effective arm reach is reduced;
- Driving[2] and carrying loads may become more difficult.

Third trimester – 28 to 40 Weeks

In the third trimester the fetus' organs mature, and its fat and muscle stores increase. For the mother this means further weight gain and increasing physical discomfort as her body adjusts to accommodate the increasing size of the fetus. Any physical difficulties that may have been present in the second trimester are likely to intensify throughout the third trimester. In addition, during this period the mother may experience symptoms including:

- Increasing abdominal weight
- Ankle swelling
- Varicose veins
- Sleep disturbance
- Fatigue
- Shortness of breath due to pressure on the diaphragm as well as other circulatory changes such as changes in venous return, cardiac function and blood volume
- Difficulty with balance as the centre of gravity continues to move forward
- Ongoing aches and pains due to the stretching of abdominal and pelvic muscles, and loosening joints and ligaments.

Pregnant employees may now also experience:

- Progressively increasing difficulty in positioning their chair close to the desk, bench or work station
- A need to slow down the physical aspects of their work
- Increasing difficulty with proper seatbelt and steering wheel placement, and getting in and out of vehicles when driving particularly for heavy vehicles
- Increasing volume and frequency of urination, resulting in the need for frequent and easy access to toilet breaks
- Dizziness or fainting particularly in hot environments
- Complications in the pregnancy that may mean they have to cease work earlier than expected.

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[2] Note: Although driving usually isn't a major difficulty as most modern vehicles can accommodate appropriate seat and seatbelt adjustment for pregnant women to ensure that the lap component is below the abdomen, it may become more difficult in cases where there may be limited access to the cab, where the steering wheel may be in an awkward position and cannot be adjusted, or if the vehicle operates regularly over very rough ground.

Nonetheless, most pregnant employees in an accommodating workplace remain capable of working safely and productively during this period.

Exercise during pregnancy

The American College of Obstetricians and Gynaecologists reviewed the existing evidence regarding exercise in 2010 and concluded that, for women with uncomplicated pregnancies, "exercise has minimal risks and confirmed benefit." Moderate exercise (three to four METS[3], or activity equivalent to brisk walking) is usually appropriate.

Some health conditions in pregnancy such as hypertension or lung disease restrict safe exercise during pregnancy. It is important therefore that pregnant women discuss their activity levels with a health professional, and make adjustments as advised.

As pregnancy progresses some women may experience a decline in overall activity and fitness levels and/or excessive weight gain. However it is important for pregnant women who engage in vigorous exercise, including physically active work, to ensure that their nutritional intake is adequate, noting that baseline energy requirements will increase as the pregnancy progresses. The combination of excessive strenuous physical activity and inadequate nutritional status intake may lead to low birth weight.

Rural and remote workers

Women who work in remote locations should have access to information about the care available regionally should a complication occur as long as labour has not started. After 28 weeks the pregnant employee should carry a letter from a doctor or midwife, dated no more than ten days before travel, confirming fitness to fly, the estimated due date, single or multiple pregnancies and the absence of complications. Individual airlines have different recommendations, however they commonly advise that for flights of four hours duration or greater, for routine pregnancies, women can travel up to the end of the 36th week for single pregnancies and to the end of the 32nd week for multiple pregnancies. On flights less than four hours' duration, for routine pregnancies, most say women can travel up to the end of the 40th week for single pregnancies and to the end of the 36th week for multiple pregnancies. After delivery, medical clearance is required for travel within seven days. Therefore depending upon circumstances and local medical resources, for very remote work most pregnant employees should not be deployed after 32 to 36 weeks gestation.

[3] *Note: METs are metabolic equivalent. One MET is defined as the energy it takes to sit quietly. Source: Harvard School of Public Health website: The Nutrition Source – Measuring Physical Activity [Accessed 13/09/17]*

Potential workplace hazards, risk assessment and control

A *hazard* is anything that has the ability to cause injury or harm. Hazards may be:

- Physical, including radiological
- Chemical
- Biological
- Psychological
- Ergonomic.

Not all workplaces can safely accommodate all pregnancies. In most jurisdictions statutory provisions indicate that employees are to be involved in the risk assessment process and the choice of workplace hazard controls. This is usually achieved through the normal workplace occupational health and safety consultation process. This includes assessing the risks posed to and by contractors and the general public.

Employers operating in higher-risk or safety critical industries where workplace hazards may jeopardise the health of pregnant employees and/or their fetus can and should specify the requirement for employees to inform their workplace of their pregnancy during the first trimester. Examples include hospital workers exposed to toxic anti-neoplastic drugs or radiological sources.

The following sections provide general information about each of these hazards and lists examples of some typical control measures. This information is not exhaustive and is not intended to replace workplace-specific risk assessment. Table 1 in Appendix 4 provides provides a list of useful clinical resources for different types of hazards.

Ergonomic hazards

Changes to a pregnant employee's capacity to stand, sit, lift, push, pull, carry and climb occur throughout the pregnancy. These ergonomic changes may increase her vulnerability to workplace injury. For example as the abdomen increases in size a pregnant employee must bend over more and reach further to pick up a load.

Due to the increased weight, forces acting on joints such as hips and knees may increase by up to 100 per cent. Furthermore, the ligaments of pregnant employees change as the pregnancy progresses and this may increase their vulnerability to sprains and strains. Pregnant employees therefore are at increased risk of developing musculoskeletal conditions such as back pain and upper limb pain. Other physiological changes increase the risk of carpal tunnel syndrome.

Ergonomic hazards may also affect the developing fetus. Both the employer and the pregnant employee should adopt a sensible approach to reduce ergonomic hazards and exposure to those hazards.

Standing

According to the Society of Obstetricians and Gynaecologists of Canada[4], after 24 weeks' gestation, pregnant women should:

- Limit prolonged standing for more than four hours
- Take several short walks throughout the day
- Rest occasionally with feet elevated
- Rotate tasks where possible, alternating between sitting, walking and standing
- Wear comfortable well-fitting shoes
- If possible, have a chair or stool at their work station
- Seek alternate duties if necessary.

[4] Society of Obstetricians and Gynaecologists of Canada, Working during pregnancy webpage. Available online: http://pregnancy.sogc.org/wp-content/uploads/2014/05/PDF_workingduringpregnancy_ENG.pdf [Accessed 13/09/2017]

The Society of Obstetricians and Gynaecologists of Canada also recommend that after 32 weeks gestation pregnant employees should limit intermittent standing defined as standing for more than 30 minutes within any one hour.

Although there is no data to support these recommendations at present, the American Medical Association has issued similar guidelines for restricting physical work at various stages of pregnancy.[5].

Heavy Work

Heavy work includes bending, climbing, lifting, pushing, pulling and carrying. The definition of appropriate or inappropriate heavy work will depend upon the physical capacity of individuals. The US Navy recommends that the "maximum pre-pregnancy load should be decreased by 20% to 25% during the third trimester".[6] Therefore assessment of reduction in work capacity will depend upon the level of physical work prior to the pregnancy.

Inappropriate heavy work may have serious consequences. For example, lifting loads greater than 10.5 kg more than 50 times per week has been associated with uterine contractions, miscarriages, pre-term birth, babies small for their gestational age and babies with a low birth weight.[7]

Both the US Navy[8] and the Society of Obstetricians and Gynaecologists of Canada[9] recommend that pregnant employees consult with their doctor or healthcare provider if their work involves the following:

- Stooping or bending over more than ten times per hour
- Climbing a ladder more than three times during an eight-hour shift
- Standing for more than four hours at one time
- Climbing stairs more than three times per shift
- Working more than 40 hours per week
- Shift work
- Lifting more than 23 kg after 20 weeks gestation
- Lifting more than 11 kg after the 24th week
- Stooping, bending or climbing ladders after the 28th week
- The need to lift any heavy items after the 30th week.

Because of individual variations in physical capacity, employers should make accommodation to allow pregnant employees to alternate heavy work with other, less tiring work. It is imperative that all employees practise safe lifting (i.e. lifting with knees bent and a straight back, or using appropriate lifting or materials handling equipment where possible).

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[5] *Please refer to Appendix 2 for further information about the American Medical Association's Guidelines for Continuation of Various Levels of Work During Pregnancy*

[6] US Navy Environmental Health Center, Bureau of Medicine and Surgery (2010), Reproductive and Developmental Hazards; a Guide for Occupational Health Professionals. Navy & Marine Corp Public Health Centre Technical Manual NMCPHC-TM-OEM 6260.01C April 2010, p. 89

[7] Teitelman, A.M., Welch, L.S., Hellenbrand, K.G., Bracken, M.B. (1990). Effect of maternal work activity on preterm birth and low birth weight. American Journal of Epidemiology, 131,104-113.

[8] US Navy Environmental Health Center, Bureau of Medicine and Surgery (2010), Reproductive and Developmental Hazards; a Guide for Occupational Health Professionals. Navy & Marine Corp Public Health Centre Technical Manual NMCPHC-TM-OEM 6260.01C April 2010, p. 93

[9] Society of Obstetricians and Gynaecologists of Canada, Working during pregnancy webpage. Available online: http://pregnancy.sogc.org/wp-content/uploads/2014/05/PDF_workingduringpregnancy_ENG.pdf [Accessed 13/09/2017]

Sitting

Prolonged sitting for more than four hours without a break may result in the following:

- Lower limb swelling
- Impaired placental blood flow
- Muscle strain or fatigue especially in the low back, neck and shoulders.

Pregnant employees should also be encouraged to:

- Use a cushion to ease stress on the low back
- Have a low footstool and change the position of feet regularly
- Refrain from crossing feet or legs
- Wear loose comfortable clothing
- Rotate sitting and standing tasks
- Use a sit-stand desk to adjust height.

Commuting for over 30 minutes per day may be associated with increased incidence of pre-term birth and babies who are considered small for gestational age. Risks may be ameliorated by appropriate ergonomic assessment of the workstation and adjustments as necessary.

Prevention of musculoskeletal conditions

Pregnancy contributes to increased risk of a variety of musculoskeletal conditions through multiple physiological changes. Pregnant women are at higher risk of developing back pain or carpal tunnel syndrome. Pregnant employees should be encouraged and enabled to:

- Change positions often
- Alternate repetitive tasks as often as possible
- Access ergonomic advice
- Be provided with appropriate ergonomic work stations
- Exercise and keep fit
- Seek medical advice should the symptoms persist.

Supine position

After the first trimester lying face-upwards, whether resting or being active, reduces cardiac output because of pressure by the uterus on the inferior vena cava. This position should be avoided as it may affect the health of both mother and fetus.

Physical and radiological hazards

Ionising radiation (x-rays, gamma rays and neutrons)

Ionising radiation from x-ray machines, particle accelerators, radioactive elements and other sources are inherently dangerous because the ionised atoms they produce in biological systems can damage biological components such as DNA. Significant exposure of pregnant women to ionising radiation can therefore cause congenital malformations, miscarriage and intrauterine growth retardation but low levels of exposure are unlikely to represent significant risk.

Examples include the potential risk from cosmic ray exposure to unborn children of pregnant aircrew. At heights of over 25,000 feet there is increased risk of exposure and some fixed wing commercial pilots are monitored. Female pilots are generally stood down at certain times through their pregnancy, usually in the first trimester due to the risk of miscarriage or ectopic rather than radiation exposure, and if breastfeeding. The timing for cabin crew is dependant upon conservative estimates for whole of pregnancy exposures. Low altitude or short distant flights pose very little risk and the risk to

passengers is very low and not considered to be of concern. Other examples include exposures to medical radioactive treatments, or some radioactive sources used in engineering and mining.

It is therefore essential that all employers, employed women with reproductive capacity, pregnant and post-partum employees comply with the relevant legislation and regulations with respect to ionising radiation exposures

Non-ionising radiation (radio frequency emitters)

Exposures to radio frequency (RF) radiation from emitters such as mobile phones, microwave ovens, radios and radars can cause adverse health effects such as burns and other heat injuries. **Population studies have not confirmed any additional risk to pregnant women or their unborn children.** However, no scientific study can confirm the absence of a risk. Studies to date nevertheless indicate that if there are any undetected risks they are small, especially for very-low-level RF emitters such as computers, video displays and mobile phones.[10]

It is essential that all employers, employees with reproductive capacity, pregnant and post-partum employees comply with the relevant legislation and regulations with respect to non-ionising radiation exposures

Extreme heat and humidity

Pregnant women may be more sensitive to heat and humidity because of their increased basal metabolic processes and the body heat of the fetus. Pregnant employees are more susceptible to:

- Heat related discomfort and fatigue
- Rashes and cramps
- Dizziness and fainting
- Heat exhaustion and heat stroke.

During pregnancy plasma volume increases and causes a relative anemia, heart rate and cardiac output increases, there is generally a fall in blood pressure and reduced blood flow via the inferior vena cava. These all together increase the risk of heat syncope or fainting.[11] The increased generation of heat results from an increased oxygen debt during physical exertion. All of this thermal load increase contributes to a heat stress environment.

Pregnant employees should:

- Avoid prolonged exposure to very high temperatures
- If working outside, take extra precautions against the heat and the sun
- Drink plenty of fluids.

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[10] Note: For more information on these study, see InfantRiskCenter Texas Tech University Health Sciences Center webpage, Radiofrequency Radiation Exposure Unlikely to Harm Pregnant Women: *http://www.infantrisk.com/content/radiofrequency-radiation-exposure-unlikely-harm-pregnant-women* [Accessed 13/09/2017]

[11] US Navy Environmental Health Center, Bureau of Medicine and Surgery (2010), Reproductive and Developmental Hazards; a Guide for Occupational Health Professionals. Navy & Marine Corp Public Health Centre Technical Manual NMCPHC-TM-OEM 6260.01C April 2010

Noise

The abdominal wall, uterus and amniotic fluid attenuates sound intensity by about 4,000 times less compared with a sound source in air at 2 cm.[12] The fetal cochlea develops in the second trimester and is therefore theoretically prone to damage with excessive noise exposures. There has been no indication of behavioural auditory responses in the cochlear before 19 weeks. Therefore fetal effects of sound exposures may vary with gestational age.

There is no data for humans and current auditory risk criteria are based upon those for non pregnant adults. However the concern remains that maternal exposure to very high sound levels may be harmful to the fetus. Therefore, all employers, employees with reproductive capacity, pregnant and post-partum employees should comply with the relevant legislation and regulations for workplace noise exposures.

Vibration

The abdominal wall, uterus and amniotic fluid provides substantially greater attenuation of high frequency compared to low frequency noise. There is no conclusive evidence that whole body vibration poses maternal or fetal risk. Nonetheless, there is concern that long term exposure to high level whole body vibration may include some increased risk of spontaneous abortion, pre-term labour and delivery, and elevated infant mortality.

Hyperbaric pressure

Although the evidence is limited, hyperbaric pressure exposure may have an adverse effect on pregnancy, fetal health and childbirth.

Potentially hazardous hyperbaric occupational environments include:

- Tunnelling operations that utilise a pressurised atmosphere
- Working in therapeutic recompression chambers
- Underwater diving (including saturation diving).

Examples of potential risks posed to the pregnant employee while diving include:

- Morning sickness combining with seasickness, while wearing a mask at depth
- Reduced respiratory function
- Circulatory competition with the placenta during physical exertion, reducing fitness and endurance
- Wetsuit size and fit (hypothermia risk)
- Lifting of often heavy diving equipment.

Examples of potential risks posed to the fetus during diving include:

- Hypoxia in the event of a diving mishap
- Hyperoxia, possibly leading to conditions seen in premature births such as blindness, closure of the ductus arteriosus, and haemoglobin breakdown,
- An increased risk of arterial gas embolism in the event of decompression illness due to gas bubbles bypassing the filtering otherwise provided by the lungs via the foramen ovale and ductus arteriosus.

[12] US Navy Environmental Health Center, Bureau of Medicine and Surgery (2010), Reproductive and Developmental Hazards; a Guide for Occupational Health Professionals. Navy & Marine Corp Public Health Centre Technical Manual NMCPHC-TM-OEM 6260.01C April 2010, p.95

Hypobaric pressure

Although the evidence is limited, exposure to hypobaric pressure may have an adverse effect on pregnancy, fetal health and childbirth. Potentially hazardous occupational environments include working at high altitude, travel in non-pressurised aircraft or in submersibles where the partial pressure of oxygen is less than sea level. Reduced air pressure may cause hypoxia for both the pregnant employee and the fetus. In the event of rapid decompression, the fetus and mother may be at risk of gas bubble formation which may result in various barotrauma in the mother and fetus. In the fetus' case these bubbles may bypass the lungs via the foramen ovale and ductus arteriosus, resulting in an increased risk of arterial gas embolism.

It is recommended that pregnant employees avoid flying on a regular basis in an unpressurised cabin at altitudes exceeding 8,000 feet which is the maximum cabin altitude in most pressurised passenger aircraft.

Deep diving where there is a risk of barotrauma should be avoided but there are no greater risks in recreational diving or snorkelling which are usually at significantly shallower depths. If in doubt advice should be sought from a specialist in underwater and diving medicine.

Chemical hazards

Chemical exposures may be via inhalation, ingestion, skin or mucous membrane absorption. As metabolism and respiration increase during pregnancy, pregnant employees and their fetuses are particularly susceptible to hazardous chemical exposures.

Most workplaces carry some degree of chemical risk. For example:

- Chemotherapeutic agents in healthcare such as antibiotics, cytotoxic agents, laboratory chemicals or cleaning and sterilising chemicals
- Cleaning solutions and laboratory supplies in schools
- Hazardous substances such as pesticides and fertilisers in the agricultural industry and food processing factories.

Not all chemicals in the workplace are hazardous but exposure to some chemicals during pregnancy may have negative effects including:

- Miscarriage
- Pre-term birth
- Growth retardation
- Low birth rate
- Birth defects.

The likelihood or otherwise of the effects of a chemical exposure on a pregnant woman and/or her fetus is dependent upon many factors:

- The nature and specific toxicity of the chemical
- The timing of the exposure, and the susceptibility of the fetus at that point in its development
- The intensity/dosage, duration and frequency of the exposure events
- The genetic predisposition of the pregnant employee and/or her fetus/unborn child.

In order to reduce the risk of adverse events from chemical exposures workplaces should:

- Understand the health effects of all chemical hazards in the workplace including those specifically relevant to pregnant workers and their fetuses and employees who intend to become pregnant

- Ensure that all employees, and in particular supervisors, are aware of the chemical hazards in the workplace and have access to relevant material safety data
- Encourage all employees to practice good workplace hygiene, for example, washing of hands before eating
- Encourage all workers, especially pregnant employees or those who intend to become pregnant, to discuss the chemical risks posed by the workplace and to encourage discussion with the occupational health and gafety representative, general practitioner, obstetrician or other health care professional
- Accommodate reasonable requests by pregnant workers or those who intend to become pregnant to avoid chemical exposures.

Biological hazards

Biological hazards include pathogenic bacteria, viruses, fungi or parasites. Some biological hazards which do not pose a significant risk to non-pregnant workers may be a risk to fetuses. Examples of these include cytomegalovirus, parovirus, coxsackie virus, rubella and toxoplasmosis.

The risk depends upon the nature of the infectious agent and its mode of transmission in conjunction with the employee's individual susceptibility and her role in the workplace. Women whose work involves contact with animals, plant products, young children[13] or people known to have an infectious disease should have access to information about the potential risks and mode of transmission.

Pregnant employees and those women who intend to become pregnant should discuss the biological hazards exposure risk with their workplace pccupational health and safety representatives, general practitioner, obstetrician, occupational physician or other health care providers. Guidance may be sought by the relevant expert in antenatal infectious diseases or infectious disease specialist to appropriately counsel pregnant employees regarding the risk of harm and the recommendation about work practices.

Steps to minimise the risk of exposure to biological hazards will depend upon the nature of that hazard and the work being undertaken. Steps include:

- Having received relevant immunisations *prior to* pregnancy
- Receiving relevant immunisations during pregnancy. Please note that not all immunisations are safe in pregnancy. The pregnant employee should consult with her medical practitioner if a vaccination is required during pregnancy and/or access the Australian Immunisation Handbook 10th edition[14] Mandated immunisation policies where relevant (e.g. hepatitis B immunisations for all healthcare workers)
- Avoiding contact with people known to be infectious for pregnant employees who are known not to be immune
- Thorough and frequent handwashing
- Making sure that food is fully cooked before eating and well-refrigerated during storage.[15]

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[13] For specific advice for childcare workers, please refer to: Australian Government, National Health and Medical Research Council (NHMRC) (2013) , *Staying Healthy: Preventing infectious diseases in early childhood education and care services (5th Edition),* pp 69-70. Available online: https://www.nhmrc.gov.au/guidelines-publications/ch55 [Accessed 13/09/2017]

[14] Australian Government, Department of Health (2015), *The Australian Immunisation Handbook 10th Edition*. Available online: http://immunise.health.gov.au/internet/immunise/publishing.nsf/Content/Handbook10-home [Accessed 13/09/2017]

[15] For information on listeria and food, please refer to the Food Standards Australia and New Zealand website page, *Listeria and food - advice for people at risk* available from: http://www.foodstandards.gov.au/publications/Pages/listeriabrochuretext.aspx [Accessed 13/09/2017]

Personal protective equipment is not generally advised but is acceptable according to the hazard and careful risk analysis. Any pregnant worker who needs to wear personal protective equipment for a known biological hazard should not be working in that situation in the first place.

Psychological hazards

High levels of stress in the workplace may exacerbate pre-existing pregnancy symptoms. Various factors at work may contribute to feelings of stress, including:

- Pressure to work quickly
- Over work
- Real or perceived job insecurity
- Fear of job loss
- Fear of being penalised
- Cultural factors
- Bullying and/or harassment from co-workers or supervisors
- High demand, low control work
- Work hours such as shift work, night work, rotating shifts, impromptu schedule changes and double shifts.

There is some evidence[16] that women in work that is considered to be demanding are less likely to conceive or deliver a child successfully following fertility treatment while lower working hours were found to be associated with better outcomes. Although this evidence cannot be directly applied to women who are not undertaking fertility treatments, it does suggest that longer working hours may be associated with lower fertility and increased risks to pregnancy.

In general it would be prudent for pregnant woman in their last trimester to limit the total number of hours worked unless extra hours are approved by the woman's medical practitioner or other healthcare provider. If long hours are unavoidable pregnant women should have access to:

- Extra breaks
- Flexibility to sit or stand
- Flexibility to stretch or do simple exercises
- If possible shifts should be rotated forwards (i.e. morning to afternoon to night) rather than backwards.

From both a psychological and physical point of view, pregnant women should have ready access to toilet breaks, meal breaks and maintenance of diet, fluids and rest as necessary. It should be reasonable for them to seek support from co-workers, family members and friends. Where feasible, employers should accommodate requests including:

- Working fewer hours
- Moving to less stressful tasks
- Changing shifts
- Moving to part time work.

[16] British Medical Journal(2017), Occupational & Environmental Medicine Press Release: 8 February 2017. Available online: /http://www.bmj.com/company/newsroom/jobs-lowered-fertility-in-women/ [Accessed 13/09/2017]

Risk assessment

Employers should conduct an occupational health and safety risk assessment to identify workplace hazards for their pregnant employees. The risk assessment is highly individualised depending upon the nature of the work and its hazards, and the factors for the individual pregnant worker. However in principle the same four step process applies:

- Step 1: Identify relevant hazards that could harm a pregnant employee or her unborn child
- Step 2: Assess the risks associated with the hazards
- Step 3: Adopt control measures to eliminate or reduce the risks
- Step 4: Document and review the risk assessment as processes or work equipment changes.

Risk controls

All assessment of workplace risks depends upon the following hierarchy of controls.

1. If possible, eliminate the hazard altogether through process changes.
2. If eliminating the hazard altogether is not possible:
    2.1. Substitute an identified hazard for less hazardous materials or processes.
    2.2. Isolate the hazard (e.g. through the use of guards or remote handling)
    2.3. Provide engineering controls such as ventilation or fume cupboards for chemical hazards
    2.4. Adopt administrative procedures to ensure safe working practices. For example changes to rostering, work breaks, work location or task design or transfer to another job. In practice this tends to be the most common, (if not always the most appropriate) hazard control measure.
    2.5. Use personal protective equipment (PPE). This is always the least preferred control measure as it depends on a variety of error-prone human factors. The use of PPE is may not be a suitable hazard control measure for pregnant employees.

Policies, procedures and plans for accommodating pregnancy in the workplace

The development of a workplace policy for pregnant employees or those employees who wish to become pregnant should consider the needs and concerns of these employees and management as well as potential workplace hazards. Although most workplaces and tasks are safe as they are, with little or no modification required, the policy should assess and outline those issues that may require adjustments to accommodate pregnant employees. Regardless of the level of risk a workplace policy for pregnant employees should entail consultation with workplace management, employees, union representatives and medical providers as required. Two illustrative case studies of workplaces implementing pregnancy policies are included at Appendix 1.

A clear example where there may be safety critical issues in a workplace is the Australian Defence Force (ADF). The ADF health policy[17] clearly specifies when the member's supervisor is to be advised of the pregnancy, what procedures should be followed and what to do if the member wishes to terminate her pregnancy or if the pregnancy ends for other reasons. These processes are appropriate for a safety critical workplace such as the ADF, however they would not be appropriate for other industries where the health risks to pregnant employees and their fetuses are minimal.

Policies for pregnant employees must comply with the relevant legislative requirements including industrial relations, occupational health and safety, anti-discrimination and other relevant legislation. Organisations may already have other workplace policies that can be applied such as:

- Alternative duties policies
- First aid policies
- Emergency first aid plans
- Flexible hours and/or part-time policies
- Job sharing options
- Employee assistance programs (EAPs)
- Routine or regular health assessments.

These policies should be reviewed to ensure that they are consistent with the needs of pregnant employees.

Policies relating to pregnancy and work should be disseminated widely and made freely available in a variety of forms, such as intranet articles, posters and newsletters. Employers should ensure that employees and managers are fully aware of appropriate policies.

Individual work plans for pregnant employees

Many, indeed most, pregnant employees continue to perform their usual duties for the duration of their pregnancies and will not require changes to tasks, environment or rosters. Some employees may require modification because of the particular nature of their pregnancy and/or employment.

In most cases managers have no legal right to be notified of an employee's pregnancy, however employees should be encouraged to notify their employer as soon as possible especially if they are undertaking duties which may or do pose a risk to the pregnancy.

[17] *Note: the ADF's policy on how pregnancy is to be managed in the ADF environment is set out in Health Directive No 235 'Management of Pregnant Members in the Australian Defence Force' ('Health Directive No 235').*

The person notified by the pregnant employee may be the only one in the workplace who knows of the pregnancy at an early stage. He or she should bear in mind that there may be times when the pregnancy does not continue to term. Employers must deal with this information in a confidential, sensitive and tactful manner mindful of the wishes of the employee.

In cases where changes to usual duties are necessary, consultation between the pregnant employee and an employer representative (for example a line manager or supervisor) is essential to the development of a successful work plan. The work plan should document all alternative duties and be revised as required as the pregnancy progresses. As an example, alternative duties may include more frequent breaks, work located closer to home, or perhaps even from home, the provision of additional equipment such as trollies or lifting equipment, redeployment to alternative sites, provision of resting rooms and other task modifications such alternating sitting and standing.

Complicated pregnancies

Some pregnant employees may have pre-existing conditions or comorbidities that place their pregnancy at higher risk. A small number of women may develop serious complications in pregnancy which can have life-threatening consequences. These include:

- High blood pressure and/or other cardiac illness
- Anxiety, depression and other psychological conditions (either new or exacerbation of pre-existing mental health conditions)
- Gestational diabetes
- Kidney disease
- Premature birth
- Poor fetal growth
- Abnormalities in the fetus
- Blood group incompatibilities.

Twins, triplets and other multiple pregnancies may also be a source of health complications. These pregnant employees require highly specialised care and some may require intensive care. As a consequence some pregnant employees may have to cease work earlier in their pregnancy than either they or their employer wish. It is incumbent upon all employers to manage such cases sensitively and provide support. Furthermore such health problems such as post-partum depression may continue after the birth of the child and accommodation should be made for those individuals. One cannot stress enough that all pregnancies are different and that both the workplace and the woman in question must allow some flexibility.

Returning to work after childbirth

Maternity and paternity leave entitlements vary between employers, states and countries. For example in New Zealand the Parental Leave and Employment Protection Act 1987 allows for unpaid leave of up to 52 weeks for birth mothers or parents adopting a child under six years old, and their spouse or partner. Eligible parents are entitled to paid leave, this was extended to 18 weeks in 2016. Employees may choose entitlements under individual employment agreements. In Australia, eligible employees who are the primary carer of a newborn or adopted child get up to 18 weeks' leave paid at the national minimum wage.

While most women experience an uncomplicated course after giving birth, employers need to be sensitive to the fact that new mothers especially often have problems with breastfeeding, minor infections and fatigue. Some mothers may have more serious complications, either as a result of

aggravation of premorbid conditions, or the development of postnatal depression, or as a result of congenital/developmental problems or ill health in the infant. Mothers and partners may be unable to return to work as planned, may require extra periods of leave after returning to work, or may need some work flexibility.

Breastfeeding at work

Breastfeeding is beneficial to the health of both women and infants. Where possible breast milk is the preferred source of nutrition for neonate and young infants. The RACP supports the World Health Organisation' (WHO) recommendation of exclusive breastfeeding to six months.[18] One of the most common reasons that women stop breastfeeding is that they need to return to work. Therefore employers should consider the breastfeeding needs of mothers returning to work. This includes:

- Breaks to express milk
- A private place to express milk
- A refrigerator in which to store expressed milk.

As it is possible for some chemical contaminants to pass into breast milk and affect the health of the baby, employers of breastfeeding mothers should conduct a risk assessment prior to their return to work. Breastfeeding employees should also discuss their needs with their medical practitioner or other health professionals before they return to work so that plans can be put in place as required.

Equal opportunity

Medical practitioners and employers need to be aware of the relevant legislation that has been enacted in their jurisdiction to ensure that pregnant employees are not disadvantaged in their employment during pregnancy, after the birth of their child or due to responsibilities as the primary carer if applicable. Although the details vary amongst different jurisdictions and countries, legislation usually specifies that discrimination relating to pregnancy is unlawful. This means that it is not appropriate to redeploy a pregnant employee to other duties simply because she is pregnant unless there are compelling and well documented medical and/or occupational health and safety concerns. Pregnancy issues also feature in industrial relations legislation and local awards and agreements; these must be considered when formulating policies or plans relating to pregnant employees.

[18] For further information on breastfeeding, see:

- The Royal Australian College of Physicians, Paediatric & Child Health Division (2007), Breatsfeeding. Available online: https://www.racp.edu.au/docs/default-source/advocacy-library/pa-pol-breastfeeding.pdf [Accessed 13/09/2017]
- The World Health Organization (WHO) website: http://www.who.int/topics/breastfeeding/en/ [Accessed 13/09/2017]
- The Australian Government National Medical Research Council (NHMRC) (2013), Infant feeding guidelines: Information for health workers. Available online: https://www.nhmrc.gov.au/guidelines-publications/n56 [Accessed 13/09/2017]

Appendix 1: Implementing pregnancy policies in the workplace: Case studies

The following fictional case studies illustrate how two organisations have implemented pregnancy policies in their workplace.

Employer operating a tourist attraction

Back of Burke Amusements (BOBA) runs a small outdoors adventure fairground. Both employees and customers participate in physical exertion. Employees are sometimes required to work at heights and to climb stairs and ladders. Periods of prolonged standing and walking for several hours are required at times with few opportunities for breaks and it is very hot for at least six months of the year.

BOBA did not have a pregnancy policy in place and the need to develop this specific policy arose as a result of a complaint made against the employer by a pregnant customer.

The company approached an occupational physician who met with them to discuss the background issues and the scope of the project. The doctor performed a worksite visit to assess the potential hazards to pregnancy of the activities for both employees and customers. She completed a risk assessment of the hazards and risks and then performed a literature review for scientific evidence of the effects on pregnancy to both mother and fetus.

She submitted a report to the company outlining the findings from the worksite visit, risk assessment and literature review. Her report included specific medical recommendations with respect to pregnancy and this particular type of work activity which included:

- Asking workers and customers to provide a clearance from their doctor to participate. For this purpose, it was advised that the doctor was provided with a specific task analysis and risk assessment of the activity.
- Excluding pregnant women from some of the activities after the second trimester of pregnancy – this was backed up with reasons and evidence.
- The employer confirming that there were several options for alternative duties for pregnant employees if required.

The report and its recommendations were used by the company to inform the development of its pregnancy policy.

The occupational physician undertook a follow-up visit to the workplace 12 months later and found it was operating well. There had been no further complaints from workers or customers since the original complaint and no adverse medical events had occurred. However, the follow up visit did highlight one additional issue that required addressing by the company. It related to privacy issues due to the required provision of medical information to put the pregnancy policy in practice . The privacy issue was particularly relevant with corporate groups doing team building activities and there had been occasions when individual customers who had been booked for the activity as a group with their employer did not wish to reveal their early pregnancy to the employer but needed to tell the tourist attraction. This was addressed through administrative changes to enable an individual customer to inform the tourist attraction of her pregnancy without having to inform her employer.

Armoured Money Transport (AMT)

AMT operates armoured vehicles that transport money to and from banks and cash dispensers; these are manned by armed guards. Although AMT did not previously require a pregnancy policy due to its workforce being predominately male, the increasing number of female employees led the company to realise the necessity of developing such a policy.

AMT's work is safety critical and requires that its employees carry a loaded firearm and meet the licensing requirements. Its employees also have to drive commercial vehicles and work in an environment where there is a significant risk of unexpected violence such as an armed hold up. They have to wear bullet proof vest with limited degree of adjustment to allow for expanding girth. These vests also lead to a significant heat load which has been confirmed by previous testing of headload and core temperatures. There are also potential exposures to lead when doing mandatory firearms training.

Due to security risks (i.e. increased vulnerability of armed hold ups), AMT's armoured vehicles cannot deviate from a set route to allow for toilet breaks which may be required by pregnant employees or new mothers due to morning sickness or to express milk. The workers load the vehicle for a day and spend several hours a day on their routes away from the depot. There are no refrigeration on the trucks required to store breast milk and employees are required to undertake significant manual handling to lift and carry boxes and bags of coins and push trolleys.

Although AMT had already conducted its own detailed risk assessment they wished to obtain medical advice to identify particular risks linked to pregnancy. For this purpose, they commissioned an occupational physician to discuss the background issues and the scope for the development of a pregnancy policy. The physician performed a worksite visit to assess the potential hazards of the activity with respect to pregnancy. She went out with one of the armoured trucks to gain firsthand experience of AMT's working conditions. She then completed a risk assessment of the hazards and risks and performed a literature review. She gained advice about the specific licensing requirements, particularly gun licence and commercial vehicle licences and ascertained whether any of these licences were impacted by pregnancy or breastfeeding.

The physician submitted a report to AMT outlining her findings from the workside visit and literature review. The report also contained specific medical recommendations pertaining to allowance for the physiological changes in pregnancy, heat load and heat stress, and the heavier tasks on lifting, pushing and pulling.

As a consequence AMT decided to remove pregnant women from armed guard duties altogether once they had declared their pregnancy. Pregnant employees were placed on depot duties for the remainder of their pregnancy. AMT also developed specific recommendations and guidelines as to how to manage the post-partum period, return to work and they made accommodations to allow breastfeeding.

AMT conducted education and consultation sessions with its employees about the pregnancy policy to inform them of the identified risks and the reasons for the recommendations, and to educate them about the importance of informing their manager of their pregnancy as early as practicable.

Appendix 2: American Medical Association Guidelines for Continuation of Various Job Tasks during Pregnancy

Job tasks and weeks of gestation
Secretarial and light clerical – 40 weeks
Professional and managerial – 40 weeks
Sitting with light tasks: • Prolonged (more than 4 hours) – 40 weeks • Intermittent – 40 weeks
Standing: • Prolonged (more than 4 hours) – 24 weeks • Intermittent: o More than 30 minutes per hour – 32 weeks o Less than 30 minutes per hour – 40 weeks
Standing and bending below knee level: • Repetitive (more than 10 times per hour) – 20 weeks • Intermittent: o 2 to 10 times per hour – 28 weeks o Less than 2 times per hour – 40 weeks
Climbing: • Vertical ladders and poles: o Repetitive (4 or more times per 8 hour shift) – 20 weeks o Intermittent (less than 4 times per 8 hour shift) – 28 weeks
Stairs: • Repetitive (4 times or more per 8 hour shift) – 28 weeks • Intermittent (less than 4 times per 8 hour shift) – 40 weeks
Lifting: • Repetitive: o Less than 25 Ib. (Approx 11 kgs) – 40 weeks o 25-50 Ib. (Approx. 11kgs to 22.7 kgs) – 40 weeks o More than 50ib. (More than approx. 22.7kgs) – 30 weeks

Source: The American Medical Association (2012) [19]

[19] American Medical Association (2012), Guidelines for Continuation of Various Job Tasks during Pregnancy. Available online: https://iuhealth.org/images/bal-doc-upl/AMA_guidelines.pdf [Accessed 13/09/2017]

Appendix 3: Commercial air travel by pregnant women[20]

"*Up to 24 weeks' gestation: No restrictions unless complicating obstetric or medical risk factors exist.*
24-36 weeks' gestation: No restrictions unless complicating obstetric or medical risk factors exist.
Doctor should give the patient a letter specifying details of the pregnancy and permission to travel. The patient should have in her possession sufficient information to allow a physician to make appropriate emergency judgments (prior obstetric history and risk factors), blood group, rubella immune status, allergies, medications, blood pressure, recent complete blood count and urinalysis, and plans for delivery.
Medical courtesy and common sense require a doctor's letter in the possession of the traveling gravida from the onset of fetal viability, namely 24 weeks of gestation.
After 36 weeks' gestation: Air travel discouraged unless unavoidable.
All airlines require a doctor's letter for patients at 36 weeks or more gestation. If travel is essential, a doctor's letter is mandatory; not just to get the patient on the plane but also for the doctor(s) that may become involved in the patient's obstetric care." [21]
The lead maternity provider (doctor or midwife) should ensure the woman is not in early stages of labour prior to certifying that the woman is safe to travel

[20] Reproduced from the American Medical Association (2012), Guidelines for Continuation of Various Job Tasks during Pregnancy. Available online: https://iuhealth.org/images/bal-doc-upl/AMA_guidelines.pdf [Accessed 13/09/2017]

[21] American Medical Association (2012), Guidelines for Continuation of Various Job Tasks during Pregnancy. Available online: https://iuhealth.org/images/bal-doc-upl/AMA_guidelines.pdf [Accessed 13/09/2017]

Appendix 4: References and additional resources

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Useful websites[22]

Australian Physiotherapy Association: www.physiotherapy.asn.au/

College of Nurses Aotearoa (NZ): www.nurse.org.nz/

New Zealand Nurses Organisation: www.nzno.org.nz/

The Australasian Faculty of Occupational and Environmental Medicine of The Royal Australasian College of Physicians, The Health Benefits of Good Work Campaign - https://www.racp.edu.au/advocacy/division-faculty-and-chapter-priorities/faculty-of-occupational-environmental-medicine/health-benefits-of-good-work

The Royal Australasian College of Physicians: https://www.racp.edu.au/

The Royal College of Physicians UK: https://www.rcplondon.ac.uk/

The Royal Australian & New Zealand College of Obstetricians and Gynaecologists: https://www.ranzcog.edu.au/

The Royal Australian College of General Practitioners: https://racgp.org.au/home

The Royal New Zealand College of General Practitioners: https://rnzcgp.org.nz

The Society of Obstetric Medicine of Australia and New Zealand: https://somanz.org/

[22] *Last accessed on 13 September 2017*

Table 1: Specific workplace hazards and useful clinical resources

Hazard types	Clinical resources
Physical	
Ionising Radiation	Health and Safety Executive (HSE) (2015), Working safely with ionizing radiation, Guidelines for expectant or breastfeeding mothers http://www.hse.gov.uk/pubns/indg334.pdf [Accessed 13/09/17]
Noise	Centers for Disease Control and Prevention (2017), Reproductive Health and the Workplace http://www.cdc.gov/niosh/topics/repro/noise.html [Accessed 13/09/17]
Biological	
Infectious diseases	Health and Safety Executive (HSE) HSE Advisory Committee on Dangerous Pathogens (2005), Infection Risks to new and expectant mothers in the workplace, ,a guide for employers http://www.hse.gov.uk/pubns/priced/infection-mothers.pdf [Accessed 13/09/17]
Chemical	
Organic solvents, anaesthetic gases, pesticides and lead	The Hospital for Sick Children (SickKids), Toronto, The Motherisk program, http://www.motherisk.org/women/occupationalExposures.jsp [Accessed 13/09/17]
Ergonomic	
Prolonged working hours, shift work, heavy physical workload, prolonged standing or sitting	The Royal College of Physicians, UK (2013), Pregnancy: occupational aspects of management https://www.rcplondon.ac.uk/resources/pregnancy-occupational-aspects-management [Accessed 13/09/17]
Psycho-social	
High job demands with low control	,Marcé International Society Position Statement 2013, Psychosocial Assessment and Depression Screening in Perinatal Women https://www.ranzcog.edu.au/getattachment/Statements-Guidelines/Obstetrics/Psychosocial-Assessment-and-Depression-Screening-i/Marce-Statement-Psychosocial-assessment-and-depression-screening-in-perinatal-women.pdf?lang=en-AU&ext=.pdf [Accessed 13/09/17]
Violence, harassment and bullying	Australian Human Rights Commission (2011), Workplace bullying: Violence, Harassment and Bullying Fact sheet https://www.humanrights.gov.au/workplace-bullying-violence-harassment-and-bullying-fact-sheet [Accessed 13/09/17]