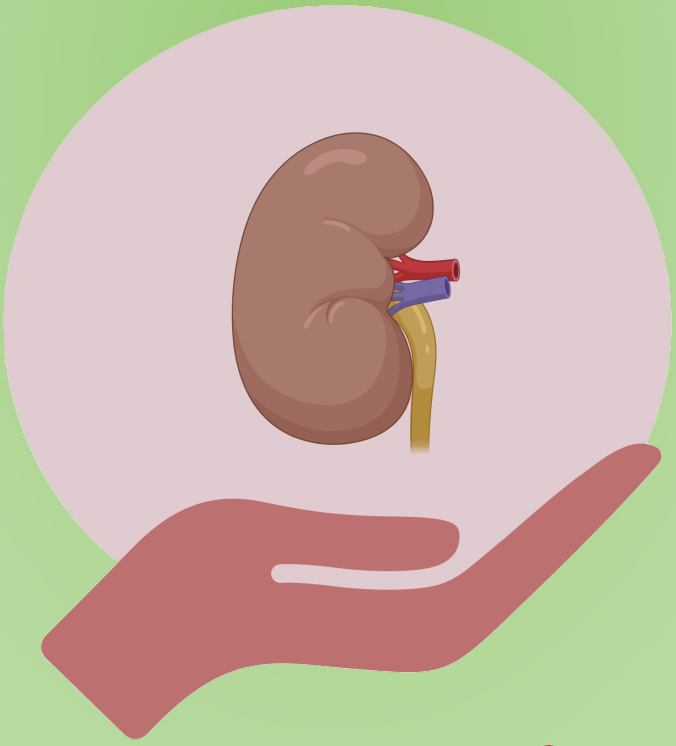
The living kidney donation journey

Key aspects of living donation in Switzerland



SOL-DHR
Swiss Organ Living-Donor Health Registry

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Introduction

Transplanting body parts or organs is not a new idea at all: myths from ancient Egypt and Greece already contain such accounts.

In Boston in 1954 the surgeon Joseph Edward Murray managed to carry out the first organ transplantation to prove successful in the long term: Ronald Herrick donated a kidney to his identical twin, Richard, who survived for another eight years. A huge success at that time! The transplantation was life-saving because dialysis treatment was not yet available. This means the very first organ transplantation to succeed for a lengthy period of time was already a living kidney donation.

As a result of new drugs to prevent transplant rejection, kidney transplantations between different family members, unrelated individuals and even deceased donors became possible in the 1960s. To this day, kidney transplantation is the best treatment option for many patients who have developed kidney failure.

Switzerland soon followed suit and became an internationally significant location for kidney transplantation. The first kidney transplantation took place in 1964 in Bern and the first living kidney donation two years later in Basel. Living donors account for nearly a third of all kidney transplantations in Switzerland today (2021- 2025 figures). This equates to roughly 110 living kidney donations per year.

Professor Gilbert Thiel, a pioneer of transplant medicine from Basel, established the Swiss Organ Living-Donor Health Registry (SOL-DHR) in 1993 in order to protect kidney donors. It was the world's first prospective health registry of this kind. Since 2008 liver donors have also been enrolled in the national registry. It organises aftercare following living organ donation and collects data on the post-donation health status and wellbeing of donors. Analysis of these data provides an important source of information, ensuring future donors are well informed and educated about living donation in Switzerland.

The continuous collection of data for the registry has also contributed to our complete revision of what is now the 5th edition of this information brochure. It outlines the living kidney donation journey, starting from eligibility to be a donor, the surgery and recovery phase, through to life after donation and potential complications. The brochure provides an information base, but it cannot replace discussions with specialists or predict how an individual's health will progress.

Our aim is to give people who are deciding whether to donate a kidney an overview of the current state of knowledge about living kidney donation and thereby help them to make their decision.

Before donation

Functions of the kidneys

The kidneys are two bean-shaped, roughly fist-sized organs. They lie either side of the spine in the upper abdomen behind the digestive organs (Figure 1). The kidneys produce urine, which flows through the ureters to the bladder.

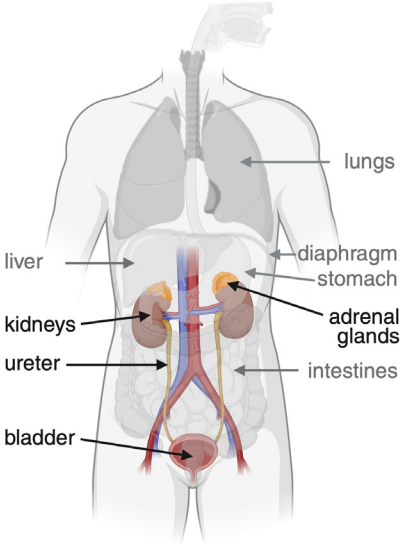

Figure 1: Location of the kidneys in the body.
Created in BioRender. Hirt, P. (2026) https://BioRender.com/cx0782j

The kidneys clean the blood and are an important regulating organ. They have five main functions:

1. Blood filter: The kidneys clean the blood and produce urine. Waste products from the body's own metabolism and foreign substances (e.g. drugs or toxins) are filtered out of the blood and excreted with the urine.

2. Water and salt balance: The kidneys determine how much water the body retains or excretes. Important minerals such as sodium, potassium, calcium or chloride are kept in balance so that muscle weakness, seizures or heart arrhythmias do not happen.

3. Acid-base balance: The pH of the blood must remain constant for the body's cells to work properly. The kidneys ensure that the blood does not become too acidic or too alkaline.

4. Blood pressure regulation: The kidneys regulate blood pressure.

5. Formation of hormones: The hormone erythropoietin is formed in the kidneys. It stimulates the formation of red blood cells in the bone marrow. Vitamin D is also activated in the kidneys so that it promotes calcium absorption and strengthens the bones.

Schünke M, Schulte E, Schumacher U, et al. 1.16 Nieren (Renes). In: Schünke M, Schulte E, Schumacher U, Voll M, Wesker K, Hrsg. Prometheus LernAtlas - Innere Organe. 6., vollständig überarbeitete und erweiterte Auflage. Stuttgart: Thieme; 2022. p.465.

Reasons for kidney transplantation

There are many diseases that can damage the kidneys and lead to chronic kidney disease (Figure 2). The most common cause is diabetes, followed by hypertension. Other possible causes are glomerulonephritis (inflammation of the filtering units of the kidneys) or inherited renal diseases such as polycystic kidney disease. Sometimes the reason for the kidney disease remains unclear.

Once chronic kidney disease has reached its end stage, this is known as kidney failure. The kidneys are no longer able to carry out their functions: waste materials and fluid accumulate in the body and several systems become unbalanced. The symptoms of kidney failure include:

- tiredness, weakness
- nausea, vomiting
- itching
- high blood pressure
- water retention, especially in the legs
- changes in urine (very little urine excreted, foamy urine)
- shortness of breath due to fluid in the lungs or anaemia

Kidney failure can be treated using a dialysis method ("blood cleansing" by a machine or peritoneal dialysis). Dialysis techniques are artificial renal replacement methods, which take over the functions of the kidneys by removing waste products and excess fluid from the blood. This often places a great burden on those affected and significantly restricts their quality of life. Apart from that, even optimal dialysis treatment is not as good as the work done by a real kidney. This is why a transplant is the best treatment option for many patients who have developed kidney failure.

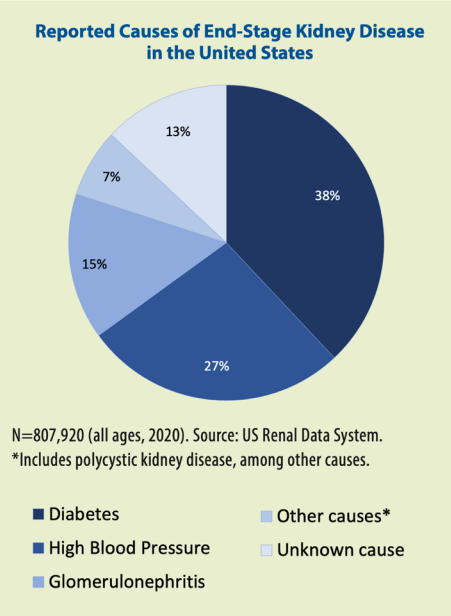

Figure 2: Causes of chronic kidney disease in the USA.
Centers for Disease Control and Prevention. Chronic Kidney Disease in the United States, 2023. Atlanta, GA: US Department of Health and Human Services, Centers for Disease Control and Prevention; 2023.

In most cases the donated kidney comes from a deceased person. Transplantation involves attaching the healthy kidney to the pelvic vessels in the lower abdomen (Figure 3). The diseased kidneys are generally left in the body because they often still have slight residual function and removing them is usually unnecessary. They only have to be removed in special cases. Although people normally have two kidneys, a single, functioning kidney is capable of performing functions that are important for normal life. This is what makes living kidney donation possible. In Switzerland living donations account for nearly a third of kidney transplantations.

Kidney transplantations, including living donations, can be performed in all six Swiss transplant centres: the university

hospitals of Basel, Bern, Geneva, Lausanne and Zurich as well as St. Gallen Cantonal Hospital.

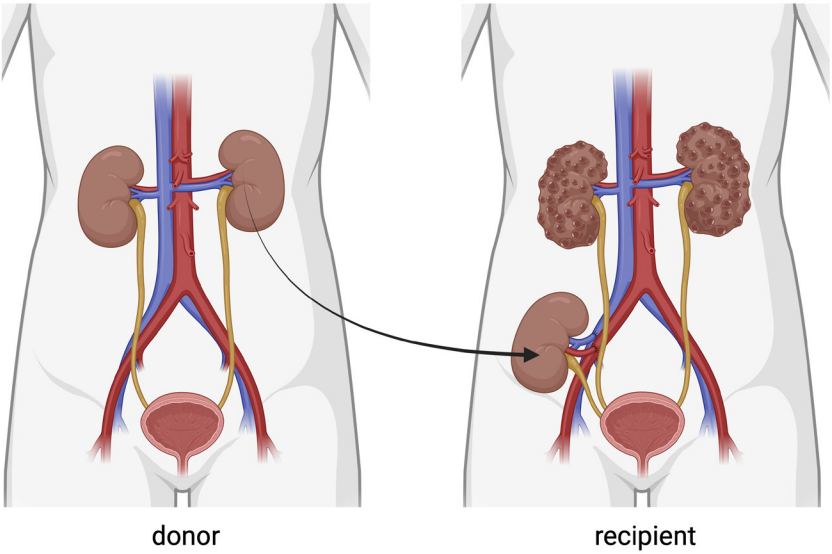

Figure 3: Schematic diagram of kidney transplantation involving living donation. The donated kidney is placed in the lower abdomen.
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Swisstransplant. Jahresbericht 2024: Swisstransplant; 2025 [Available from: https://www.swisstransplant.org/de/swisstransplant/jahresbericht].

Eligibility for living donation

Legal basis

The Swiss Transplantation Act defines the preconditions under which organs may be used for transplantation purposes. It also specifies who is eligible to be a living donor:

« Organs, tissues and cells may be removed from a living person if:
a. that person is capable of judgement and has reached the age of majority;
b. that person has been informed comprehensively and has freely given his or her consent in writing;
c. there is no serious risk to his or her life or health;
d. the recipient cannot be treated with any other therapeutic method with comparable benefit. »

Transplantation Act of 8 October 2004 (status as of 1 February 2021), SR 810.21, Chapter 2, Section 3, Art. 12.

The minimum age for living organ donation is 18 years (completed 18th year). A minor must not have any organ removed for the purpose of transplantation. Caution is usually exercised with young adults because key aspects of their personal, working and family life planning are often still unknown and it is difficult to predict future health burdens or changes. The aim is to avoid the organ donation leading to later impairments. Therefore accepting a living donation from a young adult ought to remain a well-justified exception and should not disadvantage that person's future life planning.

There is no upper age limit for living donation; eligibility is dependent on medical and psychosocial factors. So far the oldest kidney donor in Switzerland was aged 84. However, the probability of a kidney donation being ruled out for medical reasons increases with advancing age.

The decision to be a living kidney donor must be voluntary. What happens in the donation process and possible consequences of organ donation must be explained to potential donors. Everyone has the right to refuse to donate at any time and without stating reasons. A person lacking mental capacity must not have any organ removed for the purpose of transplantation.

Living organ donation is a selfless act in which a healthy person is exposed to a potential health risk in order to help a sick person. This makes it all the more important to maintain donors' safety as a top priority. Therefore potential donors undergo thorough medical and psychosocial evaluations to minimise the risks. Details of these evaluations are given in the next section.

Living donation may only take place if no other equivalent treatment of the kidney disease is available. Kidney transplantation using a living donation is the most successful treatment method for kidney failure. Dialysis treatment is frequently associated with a poorer quality of life and shorter lifetime. The prospects of successful transplantation are greater, the earlier an organ is transplanted. This is why the aim should be pre-emptive (early) transplantation even before dialysis treatment

starts. Transplantation with a living kidney donation is an event that can be planned. Donor and recipient can undergo surgery under the best possible conditions. This also gets rid of the emotionally stressful, long waiting times for an organ from a deceased person.

There must be no payment for an organ donation. According to the Swiss Transplantation Act (Chapter 6, Article 69) it is prohibited and a criminal offence for a donor to receive financial remuneration or gain any other advantage. It is also prohibited to perform a transplantation abroad if the donor is paid for the donation in another country ("transplantation tourism").

Federal Act on the Transplantation of Organs, Tissues and Cells (Transplantation Act) [Bundesgesetz über die Transplantation von Organen, Geweben und Zellen (Transplantationsgesetz)]: SR 810.21; 2004 [Available from: https://www.fedlex.admin.ch/eli/cc/2007/279/en].

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Verordnung über die Transplantation von menschlichen Organen, Geweben und Zellen (Transplantationsverordnung): SR 810.211; 2007 [Available from: https://www.fedlex.admin.ch/eli/cc/2007/280/de].

"Crossover" living donation

In the vast majority of cases, donors and recipients are either related to each other or have a strong emotional relationship (partners, close friends). Sometimes donation is not possible because of immunological incompatibility and the associated high risk of rejection. In this case there is the possibility of what is called a "crossover" living donation, which can create more favourable conditions for transplant success due to better matching of donor and recipient.

In this scheme two or several couples exchange kidneys in a crosswise arrangement. This is known as a "crossover" donation in Switzerland but elsewhere is also called a "paired" or "pooled" donation system. The crossover living donation scheme in Switzerland is regulated in a national programme. Transplant centres register incompatible couples wanting to take part with the national organ allocation centre (Swisstransplant). The allocation centre periodically identifies the best combination for a crossover living donation among all the available pairs. Only combinations in which both people in a couple have been included together may be considered. There is a certain risk that donors may not be able or may not wish to donate at the last minute or recipients have health problems so that transplantation cannot go ahead at the planned time. Therefore the fact that a chain has been identified by algorithm (with the aid of a computer program) does not automatically mean it will actually take place.

In Switzerland a living kidney donation may involve an unknown person, which is known as a non-directed (or altruistic) donation. In this case the kidney is allocated to the next person on the waiting list. Such non-directed kidney donations should, if possible, take place within the crossover

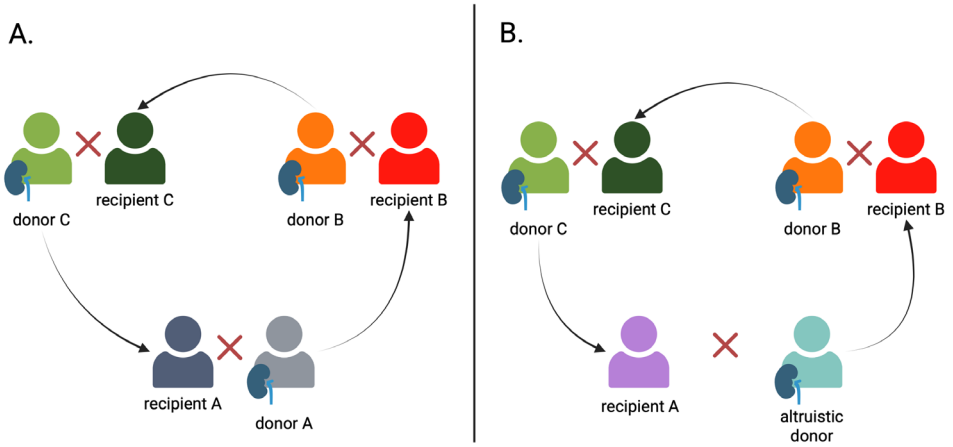

Figure 4: The principle of a cross-donation. Figure 4A: Three incompatible pairs of donors and recipients can form a chain to facilitate a living kidney donation. Such chains can include two or more pairs. Figure 4B: Process for undirected, altruistic donations. The altruistic donor forms an incompatible pair with the person at the top of the waiting list ("recipient A"), thereby enabling a transplant chain.
Created in BioRender. Hirt, P. (2026) https://BioRender.com/umh815n

living donation programme. This means that the altruistic donor forms an incompatible "couple" with the first person on the waiting list. In the case of non-directed (altruistic) donation, donors have to accept that they will not get to know the person receiving the donation and they cannot exert any influence on organ allocation.

Steiger J, Bally Ch, Banz V, et al. Medizin-ethische Richtlinien: Lebendspende von soliden Organen. Schweizerische Akademie der Medizinischen Wissenschaften SAMW. 2023. [Available from: https://www.samw.ch/de/Publikationen/Richtlinien.html]. Accessed 07.08.2025.

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Medical evaluation before donation

The highest priority is the safety of donors. The main purpose of the evaluations is to find out whether organ donation poses a particular health risk to the living donor. Only people in a suitable state of health are permitted to become donors.

The evaluations cover five key areas:

- immediate operative risk
- evaluation of kidney function and diseases that pose a health risk
- preventing transmission of diseases by the transplant
- assessments of immunological compatibility (eligibility)
- psychosocial evaluations

General information

Before the tests and examinations start, the purpose of the evaluations and how they proceed is explained in an interview. This interview usually takes place with the nephrologists (kidney specialists) who are taking care of the transplant recipients. They later arrange the enrolment for transplantation. However, the interview may also be conducted by family doctors or be held in the transplant centre itself.

Irrespective of who holds the initial interviews and assessments, an explanatory discussion and a psychosocial evaluation mostly take place at the transplant centre. The transplant centre may also arrange further investigations. The whole process through to kidney donation therefore takes time and can last several months.

Immediate operative risk

Kidney donation, like any operation, does involve surgical and anaesthesia risks. However, it is classified as a low-risk operation. General risks from any surgical procedure are infections and bleeding. Unexpected bleeding may be associated with anatomical anomalies. This is why computed tomography (CT scan) or magnetic resonance imaging (MRI scan) are performed prior to surgery in order to determine the precise position of the kidneys, their supply of vessels and the associated urinary tracts. The most common surgical complications are described in more detail in the section "After donation".

The risks of anaesthesia are mainly linked to pre-existing diseases of heart and lungs. A detailed medical history is taken and various tests are carried out in order to rule out the most serious problems with these organs. As well as a physical examination, this also includes a chest X-ray and an electrocardiogram (ECG), for example.

If there are any abnormalities, further investigations will be discussed, for instance whether to do an ultrasound scan of the heart. As a rule, people with more serious problems of the cardiovascular system are not permitted to become donors because their operative risk is too high.

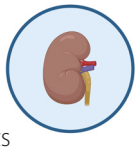
Evaluation of kidney function and other diseases

Potential donors have to be examined regarding their kidney function and diseases that pose a health risk. This means various investigations such as blood tests, scans or even tissue samples may be necessary.

The kidneys regulate important aspects of cardiovascular health, especially blood pressure. Therefore the examinations focus mainly on factors which increase the pro-

bability of cardiovascular disease (cardiovascular risk):

Kidney function



The blood creatinine level and the amount of protein lost in the urine are among the tests used to ascertain kidney function. People whose kidney function is slightly impaired may nevertheless be able to donate a kidney, provided their function is still adequate for their expected life span while having only one kidney. Whether such a donation is permitted will ultimately depend on several factors and will be decided in conjunction with the transplant centre.

Potential donors with kidney stones undergo a thorough evaluation, especially regarding the cause and risks of stone formation. People will sometimes be advised against being a kidney donor if their risk of developing stones is too high.

Hypertension



High blood pressure is one of the main causes of kidney damage. Therefore blood pressure must be closely monitored before kidney donation. High blood pressure that is well controlled with medication, without previous health consequences (organ damage), is not an absolute exclusion criterion for kidney donation, but it must be judged on an individual basis, especially bearing in mind the potential donor's age.

Overweight



Severe overweight (obesity) increases the risk of cardiovascular diseases and diabetes as well as the operative risk. Furthermore, severe overweight places a greater burden on the kidneys and can more quickly "exhaust" the kidney of someone living with only one kidney. An individual judgment must be made on whether donation is possible for a person with a body mass index ≥30 kg/m^2.

Diabetes



Diabetes damages the blood vessels and is one of the most common causes of renal disease. Kidney donations from people with type 2 diabetes should be very carefully considered and are dependent on the duration of the diabetes, the extent of the diabetes treatment, the blood sugar management and general cardiovascular risk of the potential donor. People with type 1 diabetes cannot donate a kidney.

Preventing transmission of diseases

Another objective of the pre-donation evaluations is to prevent any transmission of diseases via the donated kidney to the recipient. This concerns both infectious diseases and cancers.

In terms of **infectious diseases**, the focus is on chronic infections which have not yet caused any symptoms and are hence unknown. The blood is usually screened for the following diseases:

- hepatitis B and C
- HIV
- herpesvirus infections such as cytomegaly virus (CMV) or Epstein-Barr virus (EBV)
- syphilis

Tests will be done for other infections, depending on existing vaccinations, previous travel history or other particular circumstances. Some infections may be an exclusion criterion for kidney donation.

Active cancer is an exclusion criterion for kidney donation. To rule out the possibili-

ty, screening is done for the most common cancers. This screening includes the following investigations:

- X-ray or computed tomography (CT scan) of the chest
- ultrasound scan or CT scan of the abdomen
- colonoscopy for people aged ≥50 years
- blood tests, including PSA test in men aged ≥50 years
- gynaecological examination and/or mammogram
- a dermatological examination, if required

Assessment of immunological compatibility

Testing immunological compatibility between donor and recipient is one of the most important medical assessments. This involves identifying blood group (ABO system) and tissue typing (HLA system). The rhesus factor does not have to be taken into consideration.

The **blood group** is identified by structures (antigens) on the red blood cells. Figure 5 shows the blood groups that are compatible. Nowadays living kidney donation can go ahead even when donor and recipient have different blood groups, although such ABO-incompatible transplantation requires special preparation.

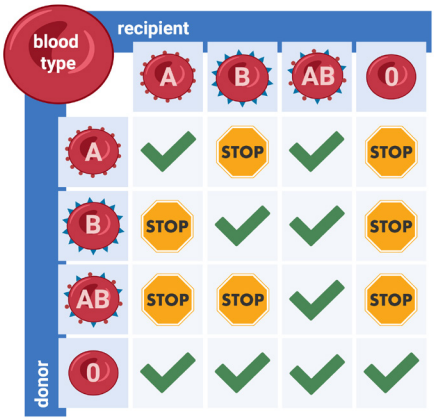


Figure 5: Compatibility of different blood groups.
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HLA system: It is not only red blood cells that have surface structures, but all cells in the body. These are known as HLA (Human Leukocyte Antigens) and help the immune system to distinguish between the body's own cells ("self") and cells foreign to the body ("non-self"). HLA characteristics are analysed in the blood of donor and recipient. In addition, the recipient's blood will be screened for antibodies to the donor HLA. This is to clarify whether there is an increased risk of a rejection reaction.

The immune system usually recognises the transplanted organ as foreign and, without treatment, would attack and reject it. Therefore recipients must take lifelong medication after transplantation in order to suppress their immune system (immunosuppression). These drugs are necessary to protect the donated organ and minimise the risk of rejection. Identical twins are the only exception: they require no immunosuppression. Figure 6 gives a simplified illustration of a rejection reaction.

Psychosocial evaluations

A living kidney donation has an impact not only on the body but also the mind and social situation of the donor. This is why a psychosocial evaluation by a professional (psychiatrist or psychologist) is required in Switzerland. The evaluation involves checking whether donors have understood the risks of a living donation, whether their willingness to donate is voluntary, whether their decision is based on sufficient information and whether they demonstrate

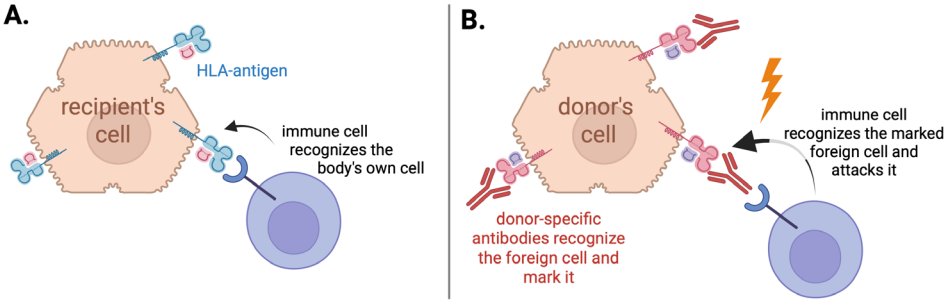

Figure 6: Simplified diagram of a rejection reaction. Figure 6A: Immune cells identify the body's own cells ("self") thanks to the HLA antigens. Figure 6B: The donor cells have different HLA antigens. There may be antibodies to these present, which then attach to the HLA antigens and mark them. The immune cells identify the marked cells as foreign ("non-self") and attack them. This attack results in a rejection reaction against the new organ.
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adequate psychological and social stability. The psychosocial evaluation includes the following points, among others:

- power of judgment
- motivation for living kidney donation
- relationship to and dependence on the transplant recipient
- psychosocial history and previous handling of stressful situations
- decision-making process
- current living circumstances

The psychosocial evaluation gives donors an opportunity to talk about any concerns or conflicts that may arise. In the decision-making process it is normal to encounter doubts in favour of or against living donation and it is important to address these during the psychosocial evaluation. The relationship with the transplant recipient may also entail certain expectations and emotional pressure. Such feelings should be openly discussed in the evaluation because a living kidney donation is final and it cannot be reversed.

The evaluations may require several interviews. In particular cases, it may be necessary to obtain further information (e.g. from a family doctor) with the donor's permission. Special care is taken to ensure that donors are making their decision voluntarily and do not feel under any pressure. Donors can withdraw their offer to donate at any time, even later in the process, without having to give reasons for doing so.

The health and psychological wellbeing of donors are always paramount. Donation is inadvisable if there is a risk that the donor's psychological wellbeing will be impaired by the organ donation.

If required, psychological support can be offered before, during and after the decision-making process.

Mental illness is not necessarily an exclusion criterion for organ donation. Whether the illness influences the potential donor's power of judgment and how stable their overall psychosocial situation is will be carefully assessed in these cases.

Federal Act on the Transplantation of Organs, Tissues and Cells (Transplantation Act) [Bundesgesetz über die Transplantation von Organen, Geweben und Zellen (Transplantationsgesetz)]: SR 810.21; 2004 [Available from: https://www.fedlex.admin.ch/eli/cc/2007/279/en].

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Verordnung über die Transplantation von menschlichen Organen, Geweben und Zellen (Transplantationsverordnung): SR 810.211; 2007 [Available from: https://www.fedlex.admin.ch/eli/cc/2007/280/de].

Donation

Planning the surgery

If all preconditions are met, the kidney donation can be planned. It is normal for donors to still have some concerns after the pre-donation evaluations. Regardless of when doubts arise, the whole transplant team will gladly take time to talk openly about those concerns. Even after all the evaluations have been completed, donors still have the right to refuse to go ahead with organ donation without stating their reasons.

The exact operation procedure will be planned during the evaluation process. Which kidney is better suited to donation is decided on the basis of the scans taken. This involves looking at the kidneys themselves, but also the blood vessels, ureters and surrounding structures. It is also useful to know whether there are any variations to watch out for during surgery.

In most cases the left kidney is removed for living donation because the left renal vein is slightly longer, making transplantation easier. However, the right kidney is sometimes removed, especially when there are anatomical anomalies (e.g. number of blood vessels, cysts, etc.). The kidney is transplanted with its artery, vein and ureter so that the vessels and the ureter can be sewn in place in the recipient (Figure 7).

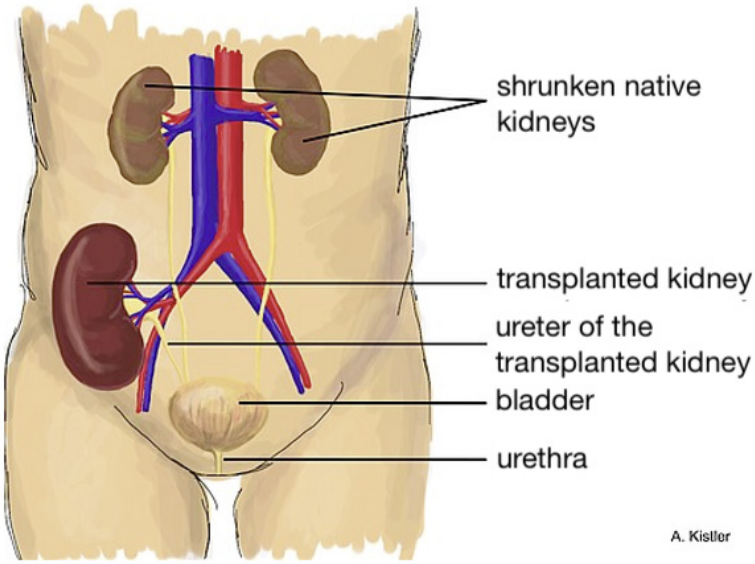

Figure 7: Kidney transplantation involves placing a donor organ in the lower abdomen in a surgical procedure and attaching it to the recipient's pelvic arteries and veins. The ureter of the transplanted kidney is inserted into the bladder..
Illustration from A. Kistler, with kind permission.

The adrenal glands sit at the upper edge of the kidneys. These are small organs which produce hormones such as adrenaline or cortisol. They are not connected to the kidneys and are left in the donor's body.

Claisse G, Gaillard F, Mariat C. Living Kidney Donor Evaluation. Transplantation. 2020 Dec;104(12):2487-2496.

Lentine KL, Kasiske BL, Levey AS, et al. KDIGO Clinical Practice Guideline on the Evaluation and Care of Living Kidney Donors. Transplantation. 2017;101(8S Suppl 1):S1-S109.

How surgery is performed

Kidney removal (nephrectomy) for a living donation takes two to three hours (or longer in individual cases) and is performed under general anaesthesia. Depending on the transplant centre, the donor will be admitted to hospital either on the day before surgery or not until the morning of the operation.

The anaesthesia details and exact surgical technique are individual and will be discussed with the surgical team (anaesthetist and surgeon). Below is a general overview of how kidney donation surgery is performed.

Nephrectomy is usually a laparoscopic procedure ("keyhole surgery"). Most of the skin incisions are small (0.5- 1.2 cm) and only a single incision needs to be made slightly larger (8- 10 cm). This larger incision is where the kidney will be removed from the body. This minimally invasive technique is preferable because the scars are smaller, there are fewer pains or abdominal complaints and donors recover from surgery more quickly. Figure 8 shows the position of the skin incisions.

Nephrectomy may also be performed using a surgical robot. The robot-assisted method (Da Vinci) is equally a laparoscopic technique ("keyhole surgery"), the only difference being that surgeons do not hold the instruments directly in their hands but control them via a console as robotic arms guide the instruments. The robot can help surgeons work with even more precision. However, it makes no significant difference to donors whether or not a robot is being used. Not all transplant centres adopt this method.

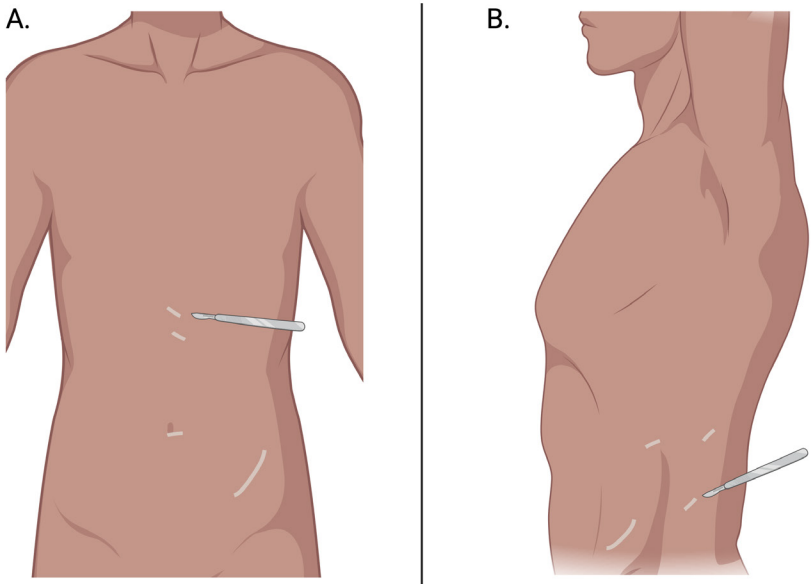

Figure 8: Skin incisions for living donor left nephrectomy using the classic laparoscopic approach (A) and the retroperitoneal approach (B). In this keyhole technique, four skin incisions are made for the instruments. One of the small skin incisions (lateral to the iliac crest) is enlarged for kidney retrieval, resulting in an incision approximately 8 cm in length.
Created in BioRender. Hirt, P. (2026) https://BioRender.com/v4mcwag

Open surgery requires a larger incision and usually only happens nowadays if complications arise during the operation.

After the skin incision the surgeon carefully works towards the kidney. The surgeon then exposes the kidney, locates the ureter and finally cuts through the vessels. Any bleeding is stopped during and after the nephrectomy and the various tissue layers are carefully sewn up again.

Immediately after being removed from the body, the kidney is rinsed with special fluid and put on ice. In many cases, the recipient is already in another operating theatre at the same time, so that the donated kidney only stays outside the body without a blood supply for a short time. As soon as the transplant team has prepared everything in the recipient, they can place the donated kidney in the recipient. The renal artery and renal vein are sutured to the appropriate pelvic vessels and the ureter is stitched directly onto the bladder.

After surgery the donor is kept under observation for a short time in the recovery room, then transferred to the regular department. The surgical wound may be sore for the first few days and may require treatment with analgesics. Most donors are mobile again after two or three days, are able to eat normally and require no further medication.

Their stay in hospital generally lasts three to five days. Donors must not lift heavy weights (>5 kg) for six weeks after the operation. Experience shows that nearly all donors are fit to work again after six to eight weeks and many donors even earlier than that. Sometimes a gradual increase in workload may be advisable. Under some circumstances, incapacity for work can last three to four months for those doing strenuous physical activity.

A first follow-up appointment after kidney donation takes place at the transplant centre four to six weeks post-surgery. After that, the Swiss Organ Living-Donor Health Registry (SOL-DHR) organises lifelong follow-up examinations.

Brügger C, Hunkeler Z, Diebold M, et al. Early Complications in Kidney Donors and Course of Health-related Quality of Life 12 mo After Donation: An Analysis of the Swiss Organ Living-Donor Health Registry. Transplant Direct. 2024 Oct 10;10(11):e1716.

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After donation

Life after kidney donation

Risks of kidney donation

Kidney donation is a medical procedure during which complications can occur. The most common and most important complications appear below. It is impossible to give an exhaustive list of all possible risks.

The figures relating to these risks are drawn from several data analyses of kidney donors who donated between 1998 and 2022 in Switzerland.

Risks due to surgery

Mortality (risk of death)

The risk of dying during or immediately after kidney donation is given as approximately 0.02- 0.03% in international studies. This equates to one death per 3000 kidney donations. In Switzerland one death following kidney donation has so far been recorded from nearly 3000 living kidney donations (SOL-DHR data, 2025).

Morbidity (risk of disease)

In Switzerland fewer than 20% of donors experience complications following surgery (Figure 9). In most cases these are minor complications, which can be treated with medication and have no lasting consequences. Major complications have occurred in only 2% of donors. A complication is rated as serious if it either requires a repeat surgical procedure or necessitates a stay in intensive care.

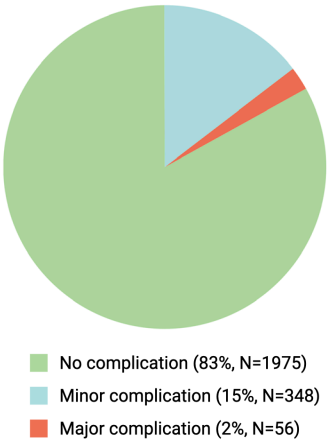

Figure 9: Incidence of complications after living kidney donation in Switzerland (SOL-DHR data).
Created with BioRender.com

The **most common minor complications** after surgery include:

- **Urogenital problems:** Cystitis (bladder inflammation) or urinary retention occurs in about 5% of donors. Cystitis is slightly more common in older donors (>70 years) and can be treated with antibiotics. Urinary retention is more frequent in men and older individuals (>70 years). Urinary retention is treated using a urinary catheter.
- **Wound complications:** Wound complications include wound infections, substantial haematomas (bruising) or wound healing disorders. This affects 2.7% of donors. Infections can generally be treated with antibiotics. Fewer than

1% of donors will need a blood transfusion because of a haematoma or intraoperative blood loss.

- **Psychological problems:** Just under 2% of donors report a depressive mood or anxiety after kidney donation. Affected donors should notify their transplant centre or the SOL-DHR at an early stage; if necessary, they can organise appropriate psychological support.
- **Pain:** 1.8% of donors still report a pain level of >7/10 (visual analogue scale) when discharged from hospital, where 0/10 indicates no pain and 10/10 the worst imaginable pain. In most cases this pain can be effectively treated with the usual pain medication.
- **Other infections:** 1.6% of donors develop other infections (e.g. pneumonia) after surgery, which can also be treated with antibiotics.
- **Other complications:** Minor complications include digestive problems, severe nausea with vomiting, position-related complications (e.g. backache or temporary nerve irritation), complications due to anaesthesia, allergic skin reactions, etc. The incidence of these complications is below 1%.

The **most common major complications** after kidney donation include:

- **Severe bleeding:** 0.8% of donors experience severe bleeding during or after surgery. During the operation any such bleeding is immediately staunched. If the bleeding only starts after surgery, the patient will usually require another operation to stop the bleeding. Transfusions may also be needed, depending on the blood loss.
- **Injury to the lymphatic vessels:** Lymph is a milky fluid that circulates in our bodies in a similar way to blood. If lymphatic vessels opened during surgery are not adequately closed, lymphatic fluid may escape and accumulate. These accumulations of lymph occur in 0.4% of donors. This build-up of fluid can be drained off (i.e. with a tube), but sometimes another operation is required.
- **Injury to internal organs:** 0.3% of donors sustain injury to internal organs (usually the bowel).
- **Pneumothorax:** Collapsed lung (pneumothorax) occurs in 0.2% of donors. This happens when air gets trapped between the lung and chest wall. Pneumothorax can be treated using a chest drain.
- **Hernia:** A weak spot forms in the abdominal wall as a result of the surgical scar. 0.2% of donors develop an incisional hernia following the operation. This means that tissue or part of the intestine is pushed outwards through this weak spot. An incisional hernia is apparent as a bulge under the scar and usually requires surgery.

Persistent pain, scar problems or adhesions in the abdomen following donation surgery are possible in rare cases. Prolonged nerve irritation is another possibility. Figure 10 gives a visual summary of the most common complications.

Long-term complications

Kidney function

One year after kidney donation, renal function is around 60-70% of its pre-donation level. This level is expected for someone living with one kidney and still equates to

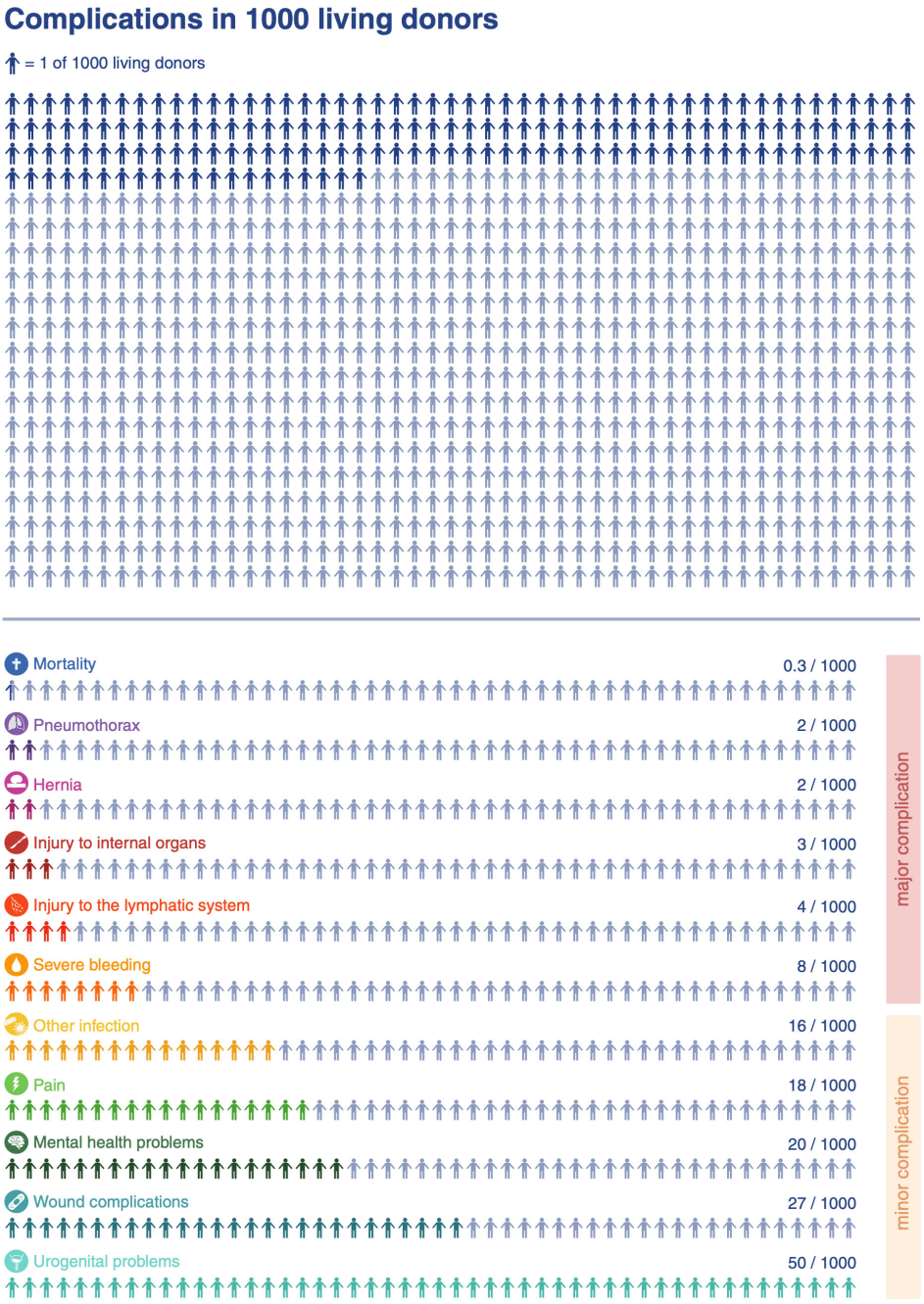

Figure 10: Incidence of different complications after living kidney donation in Switzerland (SOL-DHR data).
Created in BioRender. Hirt, P. (2026) https://BioRender.com/lm62bzi

very good kidney function. Kidney function generally remains stable in the long term. The remaining kidney adapts and is able to increase its performance to some extent. However, there are individual differences, depending on age, weight or blood pressure, for example.

Overall, the risk of kidney donors later developing severe impairment of renal function is low (<1%). Even fewer donors require dialysis: in Switzerland this affects 5 in 2987 kidney donors (0.2%, hence 2 in every 1000 donors). If this does occur, it usually does not happen until an advanced age (>80 years) and often many years after donation (on average 20 years post-donation).

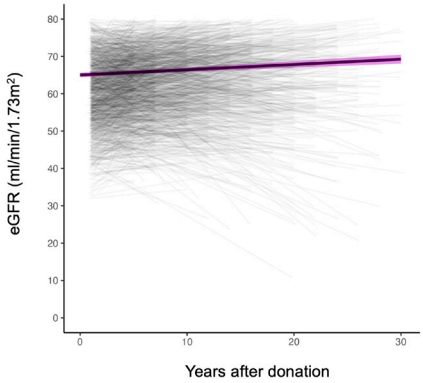

Figure 11: Post-donation kidney function graph. The thick, purple-highlighted line shows the stable kidney function of most donors over several years (SOL-DHR data).

Krättli J, Buess D, Flohr M, et al. Long Term Outcomes in Living Kidney Donors Over 30 Years. Kidney Int Rep. 2026 Jul 2;11(9):106690.

Proteinuria

Increased proteinuria indicates that too much protein is being excreted in the urine and may be a sign of kidney damage. Increased proteinuria is also seen as an independent risk factor for cardiovascular diseases (e.g. heart attack or stroke). It is still impossible to judge conclusively whether increased proteinuria is just as important in kidney donors with no previous illnesses as it is in patients with previous health burdens such as hypertension or diabetes.

0.8% of donors are newly found to have increased proteinuria one year after donation; after 10 years the rate is 1% of donors. A long-term observational study from the national registry including 1863 kidney donors with an average observation period of 12 years showed that increased proteinuria did not occur in most donors until more than 10 years post-donation. Male donors, older people and those who developed hypertension after kidney donation had an elevated risk, but not obese donors.

Hypertension

A recently published study from Canada and Australia revealed that kidney donors do not have a markedly higher risk of hypertension in the long term. The study observed 900 donors and a comparative group with a similar health status for several years. It showed that an equal number of people developed hypertension in both groups (17%). The results show that kidney donation does not cause an appreciable increase in the risk of high blood pressure.

Data from the SOL-DHR show that approx. 20% of kidney donors developed hypertension an average of seven years after living kidney donation. Hypertensive disease was associated with a higher risk of increased protein excretion in the urine. The observation period in the SOL-DHR was considerably longer than in the above-mentioned study.

Considering the latest health survey in Switzerland from 2023 (Federal Statistical Office), about 20% of the population had high blood pressure. Hypertension is a very common condition and can be treated ef-

fectively with medication. It is important to detect high blood pressure early.

If hypertension develops after a kidney donation, in view of the lack of a kidney it is extremely important to take due care to protect the single kidney. Raised blood pressure for a prolonged period is a cardiovascular risk factor and damages the blood vessels, not only the fine vessels of the remaining kidney, but also the larger vessels, which can result in heart attack or stroke.

Obesity and diabetes

Overweight donors (BMI ≥30 kg/m^2) before donation have a slightly elevated risk of developing diabetes. However, the weight progress of donors following donation is independent of their pre-donation age and weight. Weight gain post-donation can slightly raise blood pressure but does not necessarily result in hypertensive disease. Severe obesity (BMI ≥40 kg/m^2) and pre-existing diabetes are generally contraindications to kidney donation because these conditions can have a negative impact on the individual kidney (development of increased proteinuria or speeding up a deterioration in kidney function). Nevertheless, no direct correlation between being overweight and the onset of cardiovascular diseases after kidney donation has yet been proven. Whether someone who is overweight or, in exceptional circumstances has diabetes, is considered for kidney donation will always be judged within the overall context. This also applies to candidates with an elevated risk of developing diabetes.

Tiredness

In the first year post-donation around 8% of donors report increased tiredness. In most cases this improves over time, so that only 1.5% of donors complain of tiredness after five years. It is not clear why this tiredness occurs and whether it is actually linked directly to the kidney donation.

Data from the German kidney donor registry (SoLKiD) also show that tiredness after kidney donation can increase initially, especially mental fatigue. After a year roughly 18% complain of general tiredness and around 28% of mental fatigue. The tiredness persists for longer in some donors, especially people who were already stressed or tired prior to donation.

Wellbeing and mental health post-donation

Studies show that the vast majority of donors in the long term feel they made the right decision and do not regret being a donor. In a current analysis of the Swiss data, 96.5% of donors state one year after donation that they would decide to be a donor again. Furthermore, many still report a good to very good state of health years later.

It is important to realise that progress following a kidney donation can vary widely from one person to another. Individual cases may experience transient or even longer-lasting impairment of their physical or psychological health. People more frequently assess their mental health as worse if their emotional relationship with the recipient has worsened following kidney donation. Other factors such as psychological stresses prior to donation, poor social support or unexpected complications on both sides can play a role.

Data from the German kidney donor registry (SoLKiD) show a similar picture. The health-related quality of life prior to donation is high and remains generally stable afterwards. At the same time the data

recorded up to 12 months post-donation show that changes in physical and psychological health can arise which are not fully reversible. In particular, reduced vitality may persist even one year after donation. Furthermore, an increase in fatigue and body-related ailments was observed.

If physical or mental problems arise following kidney donation, it is advisable to seek support. The transplant centres or the SOL-DHR can refer donors to relevant support services, if required.

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Everyday life

Sports activity

Kidney donation should not restrict donors' social life. Resumption of work has already been described. People can usually resume sports activity one to two months after the operation. Light physical activity is possible even earlier, depending on the situation.

Diet

A healthy diet and an active lifestyle with regular physical activity are generally recommended. Donors do not have to follow a special diet. They should quit smoking and nicotine consumption.

Medication

Apart from the pain killers used for a short time after surgery, donors do not generally require any additional medication. Caution is advised with drugs that have a potentially harmful effect on the kidneys (nephrotoxicity). Donors should avoid prolonged use of such substances. If in doubt, the transplant centre or the SOL-DHR can provide help.

This particularly applies to non-steroidal anti-inflammatory drugs (NSAIDs), which are medicines with an anti-inflammatory action that have a pain-relieving effect. Examples of the active ingredients of these medicines are mefenamic acid, ibuprofen and diclofenac (brand names such as Ponstan®, Brufen®, Irfen® or Voltarol®). They can have a nephrotoxic effect if taken for prolonged periods. If possible, these substances should be avoided in the longer term. If their kidney function is good, however, donors may take them for a limited period (as a rough guide: no longer than 5 days). Analgesics containing the active ingredients paracetamol (Dafalgan®, Panadol®) or metamizole (Novalgin®) are safe for the kidneys and are therefore preferable.

Pregnancy

It is still possible to get pregnant after kidney donation. Admittedly, the risk of pregnancy complications such as high blood pressure, pre-eclampsia ("pregnancy poisoning") or diabetes is slightly raised. Overall, however, this does not seem to cause worse pregnancy outcomes (no increase in miscarriages, premature births, growth retardation, etc.).

Kidney donation cannot take place during a pregnancy. A wish to become pregnant in itself is not a reason for excluding someone from donating a kidney, but the subject should be discussed. If a donor becomes pregnant post-donation, it is imperative to inform the attending gynaecologist so that the antenatal examinations can be adjusted accordingly.

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Long-term follow-up of living donors

According to the Swiss Transplantation Act, organ donors are eligible for lifelong follow-up examinations. From the first annual follow-up, the SOL-DHR organises donors' aftercare.

Purpose of follow-up examinations

The follow-up checks are intended to ensure that donors' health is not adversely affected by their kidney donation. This is the only way that living donation can be justified. Follow-up examinations usually take place at regular intervals so that any problems are promptly detected – especially if they are related to the organ donation.

Objectives:

- To detect early any health problems following donation
- To notify donors and attending physicians of any abnormalities and treatment recommendations
- To monitor the progress of donors' health
- To analyse the long-term data in order to improve the living donation process, especially in the information about possible risks provided to candidates

The Swiss Organ Living-Donor Health Registry (SOL-DHR)

Today the SOL-DHR is a national registry for the aftercare of people who have donated a kidney or part of their liver during their lifetime and it works on behalf of the federal government. To date it has been based in Basel and it provides support for living organ donors from all six Swiss transplant centres. At the outset it only registered living kidney donors but since 2008 living liver donors have also been enrolled in the registry. At the end of 2025 the registry contained 2988 living kidney donors and 78 living liver donors.

As well as organising follow-up checks and analysing long-term data, the SOL-DHR acts as a point of contact for donors. People who are still going through the donor evaluation process can also contact the SOL-DHR at any time about questions they may have.

Kidney donors have to give their written consent to be included in the SOL-DHR. The transplant centres obtain the consent and forward it to the SOL-DHR. When someone is entered into the national registry, a record is kept of whether they consent to their personal data being used for scientific purposes. The data are handled with absolute confidentiality and are only analysed in an anonymised form. It is not possible to identify personal and health data in publications. The data analysis carried out is an important source of information for advising future donors, for transplant centres or the Federal Office of Public Health (FOPH).

Follow-up schedule

The follow-up checks take place at fixed intervals: one, three, five, seven and ten years post-donation, thereafter every two years for life (Figure 12). Donors receive by post a package containing information sheets, a form for their medical examination as well as material for blood and urine tests. Every five years a questionnaire about physical and mental health is also sent out.

All organ donors can decide for themselves whether their follow-up is carried out at their family doctor's practice, by spe-

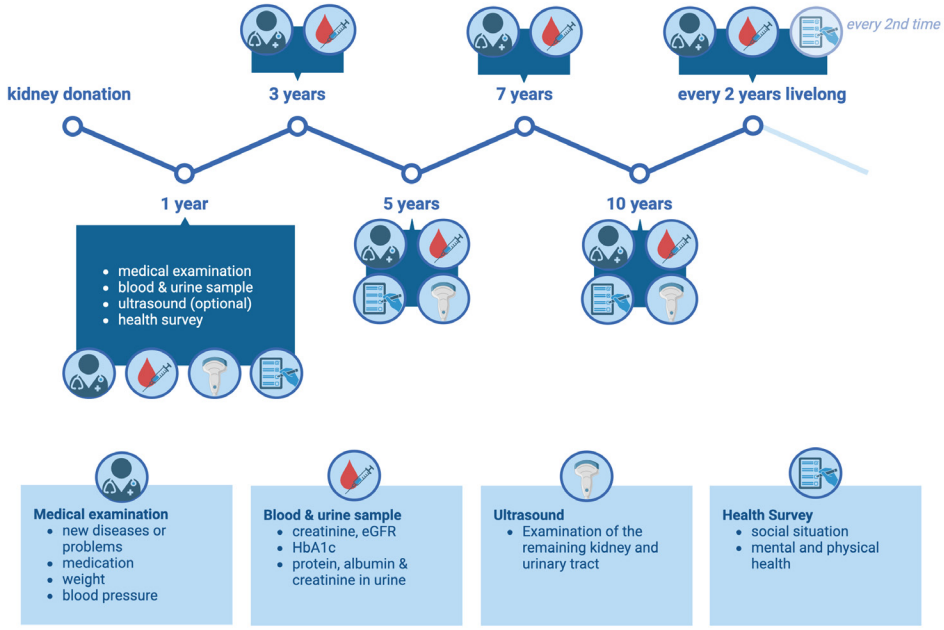

Figure 12: Schedule of follow-up examinations by the Swiss Organ Living-Donor Health Registry (SOL-DHR).
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cialists in private practice or at the transplant centre. Information about health and medication is recorded, blood pressure is measured and bodyweight is recorded. A blood sample is collected to monitor kidney function and the long-term blood sugar level (HbA1c). Urine is tested to check for any protein loss (proteinuria and albuminuria). A possible additional check at the first annual follow-up and the 5-year and 10-year checks is an ultrasound of the remaining kidney.

Since the registry was set up, the blood and urine tests have been analysed in Viollier laboratories. The results are sent to the SOL-DHR and compared with previous findings. An assessment is made of kidney function and any problems arising since donation. Donors receive written feedback from each follow-up. If there are any abnormalities, possible measures will be proposed and the attending physician will be notified.

The follow-up tests and examinations are free of charge and no excess patient's contribution is payable (see section on "Financial aspects"). Donors living outside Switzerland may also attend the follow-up examinations free of charge.

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Outcomes for recipients

Kidney transplantation has clear advantages over dialysis for many recipients: their life expectancy is often higher, there are fewer cardiovascular diseases and dialysis complications. In addition, they usually rate their quality of life as higher. Kidney transplantation is also superior from an economic point of view because it entails fewer health costs than dialysis in the long term.

A Finnish study analysed the costs of different renal replacement therapies in the first and subsequent years in 214 patients (Figure 13). The study revealed that in the first year of treatment haemodialysis causes the highest costs and CAPD (the term used for peritoneal dialysis in the study) slightly lower costs. By contrast, despite higher initial costs in the first six months, kidney transplantation is already the lowest-costing treatment option in the first year.

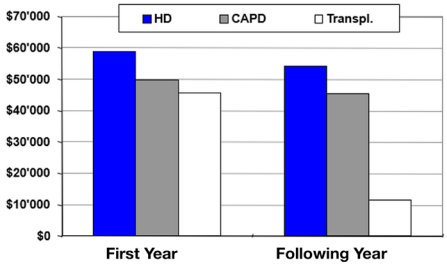

Figure 13: Comparison of the annual costs of dialysis methods and kidney transplantation.
Salonen T, Reina T, Oksa H, et al. Cost analysis of renal replacement therapies in Finland. Am J Kidney Dis 2003; 42(6):1228-38.

Living kidney donation offers further advantages over donation from a deceased person. The waiting time and hence the time on dialysis are much shorter and the transplantation can be planned. The fact that it is plannable means that kidney transplant surgery can ideally take place even before a recipient requires dialysis, when it is known as "pre-emptive" transplantation. This reduces complications caused by dialysis. In addition, donation and transplantation are performed almost simultaneously so that the kidney only remains outside the body without a blood flow for a short time. This retains optimal organ quality and minimises possible damage. These factors contribute to the fact that, in the case of living kidney donation, transplant survival (how long the donated kidney works sufficiently well) and patient survival are better (Figure 14).

Advantages of living donation:

- Shorter waiting time or no waiting time on dialysis at all
- Elective surgery with optimal preparation of donor and recipient
- Better organ quality and longer transplant survival
- Long-lasting survival advantage

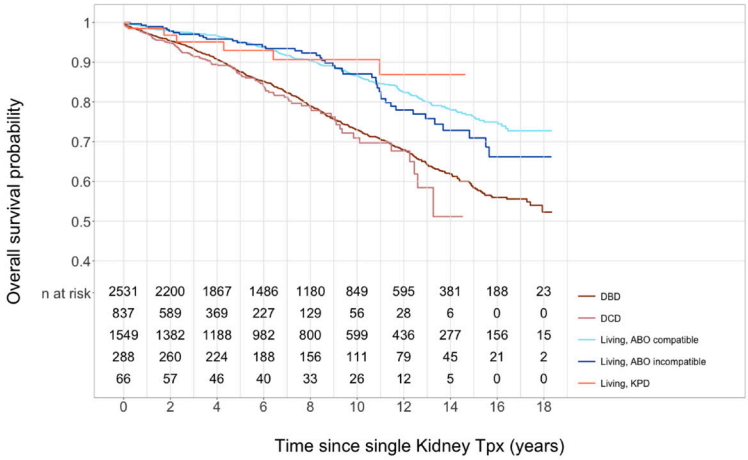

Figure 14: Survival graphs after different types of kidney donation. The graphs show the survival advantages with living donation (ABO-compatible in light blue, ABO-incompatible in dark blue and crossover donation in orange) versus deceased kidney donors (brown lines).

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Financial aspects

The Swiss Transplantation Act stipulates that donors must not incur any financial loss or make any gain from their kidney donation. It additionally states that all costs associated with donation must be covered by the recipient's health insurance scheme. For children or young adults up to 20 years of age, disability insurance (DI / IV) may also be responsible for covering costs in the event of birth defects. No costs are charged to donors' health insurance.

Despite the legal stipulations, there are sometimes problems or special cases. The transplant centres or the SOL-DHR can advise and provide support if such issues arise. Financial questions or worries should be addressed at an early stage. To avoid problems it is important for recipients' health insurers to be notified of the medical evaluation costs from the outset.

Which costs are covered?

Before donation:

- All outpatient and inpatient bills for the evaluations

During the hospital stay for kidney donation:

- Hospital costs
- Loss of earnings
- Travel expenses arising due to the stay in the hospital (Swiss Transplantation Ordinance / Transplantationsverordnung Art. 12)

After donation:

- Costs of the follow-up examinations in the transplant centre
- Lifelong follow-up checks organised by the SOL-DHR
- Loss of earnings during sick leave
- Costs of the treatment of complications that are clearly related to the organ donation (e.g. surgery for an incisional hernia)

There are a few cost items which are not clearly regulated and have to be agreed with the health insurer in advance.



These include:

- Travel costs or loss of earnings during the evaluations
- Travel costs or loss of earnings during the course of the follow-up examinations
- Temporary support at home following organ donation (if required)

Note: Only follow-up checks which have been organised by the SOL-DHR in a clearly defined time frame are paid for. This also applies to follow-up laboratory tests. The costs of additional tests that have nothing to do with the kidney donation (e.g. blood lipids) are *not* covered.

How does coverage of costs work?

The transplant centre sends the bills for the evaluation, donation and immediate follow-up examinations directly to the recipient's health insurer. If certain evaluations take place elsewhere (e.g. the family doctor's practice), the invoicing must be discussed beforehand.

The lifelong follow-up checks are funded by a lump sum payment from the reci-

pient's health insurer at the time of donation and by the federal government. This ensures coverage of costs even if the recipient later changes health insurer or dies. The lump sum payment is also provided if the donor utilises aftercare through the SOL-DHR. If individuals prefer not to be included in the SOL-DHR, they have to contact the recipient's health insurer directly. As far as possible, the transplant centre should support the donor in doing this. However, it is important to realise that this route can be more time-consuming.

Bills for the follow-up examinations should be delivered directly to the SOL-DHR. The laboratory invoice is also sent directly to the SOL-DHR.

If compensation for travel costs has been agreed with the insurer, it is important to clarify how the payment will be made: several insurers pay this money to the recipients who then have to pass it on to donors.

How does coverage of costs work for non-directed kidney donations or crossover living donations?

The same rules apply to non-directed organ donations as to directed donations, but the costs resulting from pre-donation evaluations are only reimbursed once transplantation has taken place. The same also applies to loss of earnings. This means there may be a delay between the costs arising and reimbursement by the insurer. If transplantation does not go ahead, either the recipient's insurer or the federal government will meet the costs incurred.

For crossover living donations, the insurance scheme of the person who forms an incompatible couple with the donor (hence the next person) will cover the costs arising.

How does compensation for loss of earnings work?

The recipient's health insurer covers the costs of loss of earnings. Compensation applies to loss of earnings related to the donation, both during the pre-donation medical evaluations and after kidney donation. To make payment the insurer requires an official document (e.g. a doctor's report).

Most employers will support an organ donation. However, there is no obligation to release a donor from work for this purpose. There are two possibilities:

- Leave of absence: Employers continue to pay wages just as in an illness-related absence and the recipient's health insurer reimburses them the costs (wages and employer side-costs).
- No leave of absence: The donor obtains unpaid leave for the donation. The person concerned gets back the lost income directly from the recipient's health insurer.

For self-employed people, their loss of earnings is calculated on the basis of their last tax return, regardless of whether they hold daily benefits insurance. The recipient's health insurer will provide an appropriate form and a list of the documents required. The transplant centre will gladly provide advice and support in this matter.

Living donors from outside Switzerland – what are the key issues?

In principle, the same preconditions apply to donors from abroad as to people resident in Switzerland. However, individual

aspects may be more complex and more difficult to verify in another country.

When donors come from abroad, travel costs are often an issue. It is imperative to clarify this matter with the insurer before making any travel arrangements. Discussions should include how many journeys will be necessary (examinations, donation, follow-up) and how high the resulting costs will be. The transplant centres can provide support on this matter.

Not all insurers are prepared to make payments to outside Switzerland. In that case, the compensation is transferred to the recipient who will have to pass on the money.

When the evaluations for a potential living kidney donation start, the initial examinations can readily be organised close to where a donor candidate lives. Provided the results indicate the person is suitable for donation, the individual will then be invited for further tests at the transplant centre.

While abroad, donors can still take part in the aftercare provided by the SOL-DHR. The notice of follow-up is sent abroad and the check-up can be done close to where the donor lives. Unfortunately, the material for blood collection and urine testing cannot be sent to another country, but the covering letter will detail what the testing should involve. An explanation is also given of how to invoice the costs. The SOL-DHR will pay bills for up to CHF 220 per follow-up (as of 2026).

Current data show, however, that the probability of stopping the medical aftercare in the years following a living kidney donation is higher for living donors resident abroad than for people living in Switzerland. Possible reasons are that it is more difficult to reach organ donors, there may be language barriers and differences in the prevailing health systems and healthcare structures. These circumstances pose a risk to the essential protection of donors because there is an increased probability of early or imminent diseases not being detected promptly and treated appropriately. These observations may mean that transplant centres are more reluctant to use living donors from outside Switzerland.

What happens in the event of complications?

The transplant centres are obliged to take out insurance for donors for 12 months from organ removal (covering death and invalidity occurring as a result of the organ removal).

The recipient's insurer will cover the costs caused by early complications that are clearly donation related. The costs are also covered in the same way when there are long-term complications clearly connected to the organ donation (e.g. incisional hernia).

The donor's own health insurer will pay for the treatment of consequences that are not clearly connected to the organ donation (e.g. developing hypertension after a few years).

Can you take out new insurance as a living organ donor?

Living organ donors should not be disadvantaged when taking out new insurance (supplementary insurance policies through their health insurance fund, life insurance, etc.). Nevertheless, difficult discussions unfortunately arise time and again. Health insurance schemes legally

have the right to refuse supplementary insurance policies and can define the criteria for this themselves. It is therefore advisable to take out new insurance policies before the donation process. This does not apply to the provision of basic health insurance for which there is a duty to accept.

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