As the bladder fills, pressure is exerted on the bladder wall, neck and urinary sphincter, stimulating the urge to urinate (Montague et al, 2005). In the supine position, the effects of gravity are negated and the urge to urinate is greatly reduced. In an upright body, gravity causes the abdominal organs to press downwards and exert pressure on the bladder. In people confined to bed, these organs shift towards the thorax (see part 1) and pressure on the bladder is reduced. This can significantly decrease the urge to urinate even when the bladder is full. It is often difficult to completely empty the bladder into a bedpan or urine bottle when supine. Patients often feel uncomfortable and embarrassed about using bedpans, further increasing the chances of urine retention.

An over-distended bladder stretches the smooth muscle layer within the bladder wall and, over a period of time, the stretch receptors (which monitor bladder filling) can lose sensitivity, reducing the urge to urinate. Urinary retention can be reduced by encouraging patients to take regular drinks of water and by discouraging the use of bedpans and urine bottles in favour of commodes or, if possible, regular visits to the toilet.

In patients who cannot walk, a catheter may be necessary.

Renal calculi and urinary tract infections

Over-distention of the bladder can cause small cuts or tears to develop in its epithelial lining, providing sites for opportunistic infection. Prolonged bedrest increases the risk of precipitation and crystallisation of urinary solutes, which can lead to renal calculi (kidney stones).

A major detrimental effect of prolonged bedrest is a gradual demineralisation of bone tissue (see part 3). The major minerals lost from bones are ionic calcium and phosphate, which accumulate in the blood and are subsequently excreted in the urine and faeces. Excess calcium in the glomerular filtrate greatly increases the chances of renal calculi forming in the static urine pools within the renal calices (Fig 2).

Urine retention and stasis encourage the growth of urea-splitting bacteria such as Proteus sp. These can work their way up the urinary tract and increase the pH of the urine (making it more alkaline), encouraging the precipitation of calcium and contributing further to the formation of renal calculi. The chances of kidney stones forming can be reduced by light bed exercises and by taking bisphosphonate drugs (Atsushi et al, 2008).

**REPRODUCTIVE SYSTEM**

The effect of immobility on reproductive biology is poorly understood. In both men and women, prolonged bedrest is associated with falling levels of circulating sex hormones (Brown, 2008).

Lack of physical activity in men reduces both the level of circulating androgens (testosterone and testosterone-like hormones) and spermatogenesis (sperm production). Regular physical activity is linked to a healthy libido in both sexes.

In women, an active sex life is associated with a stable and regular menstrual cycle. Conversely, prolonged bedrest can lead to significant disruption to the menstrual cycle. There is a general lengthening of the menstrual cycle during bedrest, potentially due to a delay in ovulation because of changes in the secretion of luteinising hormone (Wade, 2008).

This author speculates that these changes to the menstrual cycle and female sex hormones may contribute to some of the adverse effects associated with bedrest, including the loss of bone mass and reductions in blood volume (Wade, 2008).

**NERVOUS SYSTEM**

Patients confined to bed in hospital often experience a reduction in environmental stimuli because of severely limited opportunities for being mobile outside their immediate environment and social interaction.

This restriction is sometimes referred to as sensory deprivation (Hayes, 2000) and it can have a knock-on effect on human behaviour.

Information comes to the brain from two sources: outside and within the body. External information constantly competes with internal information for the individual’s attention.

When the external environment is relatively ‘quiet’, increased attention is paid to information coming from within the body.

Niven (2006) explained how people who perceive their occupation as boring and dull report more physical symptoms and take more medication than people with interesting, absorbing jobs.

Sensory and social deprivation have been linked to changes in brain neurochemistry, which may be associated with altered sensory perception, disorientation and confusion.

Major neurotransmitters, including dopamine, noradrenaline and serotonin, are all reported to drop after periods of inactivity (Norton and Sibbald, 2004).

The sensory isolation experienced by people when confined to bed is often associated with restlessness, increased aggression, insomnia...