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Casting and drawing lots: a time honoured way of dealing with uncertainty and ensuring fairness

William A Silverman, Iain Chalmers

The lot causeth disputes to cease, and it decideth between the mighty. 
*Proverbs* 18:18

What is the ethical basis for offering treatments within a controlled trial? It is either because the doctor and patient do not know which treatment is preferable or because it is the fairest way of deciding who will have a treatment that is in short supply. But what mechanisms should be used to decide who shall receive which treatment and to ensure that the hoped for benefits and unknown risks of inadequately tested treatments are distributed fairly? And how can we ensure that limited supplies of a treatment that may be beneficial are allocated fairly? A solution is found by turning to random allotment, the modern equivalent of one of the oldest practices in human history—the casting or drawing of lots.

An age old custom

Jewish law and the early Christian church outlawed the casting lots for divination—at least by the faithful masses, if not by God's authorities on earth. By contrast, casting or drawing lots to assure fairness in allocating duties or rewards has been acceptable for millennia. Human societies have used pebbles, nuts, barleycorn, bones, twigs, yarrow stalks, polished sticks, cards, coins, and dice—the list goes on and on—to make decisions that are transparently fair.

In the *Book of Numbers* the tribes of Israel are instructed to “Divide the land by lot, for an inheritance among your families”; and at the time of the second temple priests drew lots from the temple urn when differences arose in civil and everyday life. At the end of the 18th century, when Britain was preparing for an expected French invasion of Ireland, each county and county borough was asked to provide a certain number of men for defensive militias. Lists of eligible men were drawn up by parish constables. Names were then randomly selected from the list until the quota for each district was complete. Military draft lotteries were used in Austria-Hungary in 1889-1914 and in the United States and Australia during the Vietnam war.

Seen to be fair

Lotteries have been accepted as a fair, democratic way of making difficult choices. The US secretary of the war department, speaking at the beginning of the 1917 military draft lottery, captured the essence of this idea: “This is an occasion of great dignity and some solemnity. It represents the first application of a principle believed by many of us to be thoroughly democratic, equal and fair in selecting soldiers to defend the national honor abroad and at home.”

Legal judgments have sometimes emphasised the fairness of drawing lots to decide matters of life and death. In considering a charge of manslaughter brought against a sailor in the 19th century, an American judge concluded, “When the ship is in no danger of sinking, but all sustenance is exhausted, and a sacrifice of one person is necessary to appease the hunger of others, the selection is by lot. This mode is resorted to as the fairest mode … we can conceive of no mode so consonant both to humanity and to justice.”

From solemn to less solemn uses, there are many uses of lots to ensure fairness these days. These range from deciding who should be allocated limited quotas of immigration visas and university places to who should be allocated which dormitory rooms at university (S Fienberg, personal communication) and who shall receive the sum of the separate investments of the millions of people who buy lottery tickets.

**Summary points**

- Casting or drawing of lots has been used for thousands of years to help deal with uncertainty and ensure fairness.
- It was proposed in the 17th century and adopted in the 19th century for making fair comparisons between alternative medical treatments.
- It has also been used for the fair distribution of limited resources.
- It is a fair way of distributing the hoped for benefits and unknown risks of inadequately evaluated forms of health care.
Lotteries in health care

Lottery has been used and is still used to ensure fairness in health care. In the 17th century, to settle a dispute he was having with orthodox practitioners who used bloodletting and purging for treatment, the Flemish physician John Baptiste Van Helmont made the following proposition: “Let us take out of the hospitals … 200 or 500 poor people, that have fevers, pleurisies. Let us divide them into halves, let us cast lots, that one half of them may fall to my share, and the other to yours; I will cure them without bloodletting and sensible evacuation; but you do, as ye know. … We shall see how many funerals both of us shall have.”

Van Helmont’s point was that when uncertainty and disputes exist about the relative merits of alternative treatments, fair comparisons would result from allowing chance to decide who should receive which treatments. Examples of the adoption of this principle in practice (by using alternate allocation to different treatments) began to appear at least as early as the 19th century. A nice example of patients themselves drawing lots to decide which treatment they would receive was reported by a British obstetrician in the Lancet the following century: “An equal number of blue and white beads were placed in a box. Each woman accepted for the experiment was asked to draw a bead from the box. Those who drew blue beads were placed in group A while those who drew white beads were placed in group B.”

A decade later, in a celebrated study by the Medical Research Council reported in the BMJ, lottery in the form of random sampling numbers was used to decide which patients with pulmonary tuberculosis would receive streptomycin as well as bed rest, and which bed rest alone. This randomised study is often seen as having ushered in a new era in making fair comparisons of alternative treatments. Using lottery (random allocation) to decide who shall receive which treatments when uncertainty exists about their relative merits and demerits has now become a widely accepted component of efforts to increase knowledge in therapeutics.

The randomised trial of streptomycin also illustrates how lottery has been used to distribute limited supplies of a potentially beneficial intervention. This “democratic” use of lottery continues to be used today—for example, in a randomised trial of preschool day care in Hackney.

Ambivalence

Alongside a belief in the fairness of lottery as a way of distributing benefits or harms, there’s also some ambivalence. The accusation, “It’s a lottery,” suggests that people wish there were better ways of making the decision in question. In medicine at least we suggest this ambivalence stems from the confusion about “knowing” in medicine. The dilemma has become acute as medicine struggles to become scientific—to move from belief in authoritative declarations to a critical questioning of authority. The impersonal rules of evidence are slowly replacing the voice of respected sages.

For ages the ailing have turned to healers who professed to know how to bring relief and cures, but the affected gave little thought to the question: How do they know? Physicians (and others to whom people turn for help) often find it painful to discuss the uncertainty about the effects of their treatments, but this is essential if we are to sort out efficiently which treatments do more harm than good. Just as drawing lots challenged the authority of priests in the past, so random allocation to decide which patients should receive which treatment often challenges the authority of individual physicians. But when there is uncertainty about the relative merits of the double edged swords we wield in medicine today, we are wise to employ this ancient technique of decision making. It is a fair way of distributing the hoped for benefits and the unknown risks of inadequately evaluated treatments.

This paper is based on a more detailed treatment of this topic at www.rcpe.ac.uk/controlled_trials/casting.html. We are grateful to James King for supplying material relating to military drafts in Ireland and Australia, and to Steven Fienberg and Ted Kapchuk for drawing our attention to relevant material and for commenting on earlier drafts.

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