OFFICE OF FAIR TRADING

Annexe C

GP survey

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CONTENTS

1 SUMMARY

1.1 This annexe describes the results of research into practitioners' knowledge of drug prices for selected types of commonly prescribed drugs. The results are taken from a survey of 1000 general practitioners conducted as part of the National Audit Office's value for money study into the drugs bill for primary care. The study remit was to investigate the scope for the NHS to manage this spend better and reduce wastage, without affecting clinical outcomes.

1.2 As part of this research, the NAO kindly agreed to the inclusion of a number of questions of importance to the PPRS study, formulated by the OFT. These questions invited the practitioners taking part to rank various commonly prescribed branded drugs in order of price.

1.3 Based on a total of 24 drugs considered in six groups, practitioners' overall ability to rank branded drugs in order of price proved no better than chance. There were, however, some significant differences between the results for different groups, and in several groups practitioners did significantly better than would be expected by chance and in others significantly worse.

1.4 In the groups where results were poor, there was some evidence that practitioners did badly in those cases where generic competition existed for some of the branded drugs, and at the same time there was a large difference between the price of the branded and generic versions.

1.5 The results of those questions set by the NAO as part of its research are not reported in full. However, these questions were analysed systematically by OFT to see if any factors could be found that resulted in better price ranking ability. The results were negative.

1.6 Despite conducting numerous statistical tests, only a very few proved statistically significant. These were sufficiently few to suggest they were purely chance effects and also exhibited others features that indicated they were not reflective of any real relationships.

2 METHODOLOGY

NAO value for money study of the drugs bill in primary care

2.1 At its website (www.nao.org.uk) the National Audit Office describes its role in helping the nation to spend wisely. The National Audit Office scrutinises public spending on behalf of Parliament. The NAO is totally independent of Government and is headed by the Comptroller and Auditor General, Sir John Bourn.

2.2 The NAO audits the accounts of all central government departments and agencies, as well as a wide range of other public bodies, and reports to Parliament on the economy, efficiency and effectiveness with which they have used public money. The work of NAO saves the taxpayer millions of pounds every year (source: as above).

2.3 Among work currently in progress, NAO is conducting a value for money study of the drugs bill in primary care. In the English primary care system in 2005 around 700 million prescriptions were dispensed and more than £8 billion was spent on drugs. The study remit was to investigate the scope for the NHS to manage this spend better and reduce wastage, without affecting clinical outcomes.

2.4 The NAO announced its plans to employ a range of methodologies to examine the potential for improvements, and the means of implementing them, including a national survey of primary care trust advisers, a survey of the prescribing behaviour of general practitioners (GPs), and case studies to highlight good practice examples in prescribing. The NAO expect to report in the spring of 2007.

NAO survey of general practitioner prescribing behaviour

2.5 Understanding the prescribing behaviour of GPs is important to the NAO study but also has relevance to the present OFT market study into the PPRS. Given this common interest, NAO and OFT decided to work together to design a survey of GP prescribing behaviour. This annexe presents the key results of that survey, which aimed to shed light on two main areas:

- the relative importance of the different influences on GP prescribing behaviour, and
- the extent of GP awareness of the relative prices of commonly-prescribed drugs.

2.6 The NAO financed, commissioned and managed the survey in addition to designing the questions relating to the first area. The main input of OFT was in the design of questions and interpretation of results relating to GP price awareness.

2.7 The NAO commissioned an external contractor to conduct an on-line survey of the prescribing behaviour of 1000 GPs. Fieldwork for the survey took place between 18 August and 27 September 2006. The results of the study will feature in due course in the NAO report but NAO has kindly allowed OFT to draw on the results of the survey here.

2.8 A copy of the full questionnaire is attached at the end of this annexe. The information shared with OFT was entirely anonymous and no personal details of any kind were involved.

Questions designed to assess the relative importance of influences on GP prescribing behaviour

2.9 The results presented in section three below and the results in other sections of this annexe is that of OFT and should not be interpreted as representing any views, opinions or conclusions of NAO.

Questions designed to test general practitioners' ability to rank drugs in order of price

2.10 In addition to addressing its own research program, NAO kindly allowed OFT to design and include a selection of questions in the study relating to general practitioners' ability to rank drugs in order of price.

2.11 This part of the survey posed a series of questions, where respondents were asked to rank various groups of branded drugs, 'in order of the most expensive to the least expensive without referring to any price lists. Please do not consider the price of generics'. For emphasis, the final instruction, 'Please do not consider the price of generics', was repeated for each group.

2.12 This question was repeated for six groups of drugs. With allowance for the fact that the survey was conducted on-line, the table below shows as accurately as we are able the format of these particular questions as they appeared to those taking part.

Table 2.1: Drug price ranking questions

Rank *Proton Pump Inhibitors* in order of the most expensive (1) to the least expensive (4), without referring to any price lists. Please do not consider the prices of generics. ☐
(Check all that apply)
☐ Esomeprazole (Nexium), Tablets, 20 mgs, 28 pack
☐ Lanzoprazole (Zoton), Capsules enc. E/C granules, 30 mgs, 28 pack
☐ Omeprazole (Losec), Capsules enc. E/C granules, 20 mgs, 28 pack
☐ Rabeprazole (Pariet), EC Tablets, 20mgs, 28 pack

Rank *Statins* – in order of the most expensive (1) to the least expensive (4), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- Atorvastatin (Lipitor), Tablets, 10 mgs, 28 pack
- Pravastatin (Lipostat), Tablets, 40 mgs, 28 pack
- Rosuvastatin (Crestor), Tablets, 10 mgs, 28 pack
- Simvastatin (Zocor), Tablets, 20 mgs, 28 pack

Rank *ACE Inhibitors and AII Receptor Antagonists* – in order of the most expensive (1) to the least expensive (6), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- Candesartan (Amias),Tablets, 8 mgs, 28 pack
- Enalapril (Innovace),Tablets, 10 mgs, 28 pack
- Irbesartan (Aprovel),Tablets, 150 mgs, 28 pack
- Losartan (Cozaar),Tablets, 50 mgs, 28 pack
- Perindopril (Coversyl),Tablets, 4mgs, 30 pack
- Valsartan (Diovan),Capsules, 80 mgs, 28 pack

Rank *SSRI Antidepressants* – in order of the most expensive (1) to the least expensive (4), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- Citalopram (Cipramil), Tablets, 10 mgs, 28 pack
- Escitalopram (Cipralex), Tablets, 10 mgs, 28 pack
- Fluoxetine (Prozac), Capsules, 20 mgs, 30 pack
- Paroxetine (Seroxat),Tablets, 20 mgs, 30 pack

Rank *Other antidepressants* – in order of the most expensive (1) to the least expensive (3), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- Mirtazapine (Zispin) , SolTabs, 30 mgs, 30 pack
- Reboxetine (Edronax), Tablets, 4 mgs, 60 pack
- Venlafaxine (Efexor), Tablets, 75 mgs, 56 pack

Rank *Non-Steroidal Anti-Inflammatory Drugs* - in order of the most expensive (1) to the least expensive (3), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- Celecoxib (Celebrex), Capsules, 200 mgs, 30 pack
- Etoricoxib (Arcoxia), Tablets, 60 mgs, 28 pack
- Meloxicam (Mobic), Tablets, 7.5 mgs, 30 pack

2.13 In selecting groups and drugs for the analysis, OFT took advice from a range of medical experts including Dr Neal Maskrey, Medical Director of the National Prescribing Centre.

2.14 The groups and drugs chosen were selected to be commonly prescribed and familiar to practitioners. Each group contains drugs that are widely agreed to be close therapeutic substitutes and is a major expenditure area. Two of them – the statins and the proton pump inhibitors – account for respectively the most and second-most NHS expenditure of any chemical class. All of the six groups are consistently among the ten largest components of the drugs bill.[1]

2.15 Each of the groups contains numerous drugs in many presentations (forms and strengths, for example tablets of a specific size or injections of a certain concentration). We selected for inclusion the most commonly prescribed branded drugs, forms, strengths and pack sizes, with a view to providing GPs with a manageable list of around six highly recognisable products to rank in each group. There was no attempt to select items that would be especially easy or difficult to assess for price.

2.16 It was originally intended to include generics in the survey questions is but, on consideration, this proved impractical. The prices of many generics are considerably more volatile than the prices of equivalent brands[2], with the result that including them may have made the task of determining price relativities unreasonably difficult.

2.17 This annexe does not present the results of the NAO study in full. It would not be appropriate to publish these results in isolation and in advance of the full NAO study which will combine them with other evidence, and present the results in a wider context.

2.18 This annexe does make reference to the sample demographics which we consider demonstrate suitable regional coverage, and acceptable representation of different levels of experience and gender. Indirect reference to some of the NAO results also proved unavoidable when demonstrating how the factors examined in the NAO questions were found to have no influence on GPs' ability to rank prices.

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[1] By various definitions of 'component', for example British National Formulary (BNF) Paragraph or Sub-Paragraph.

[2] See Annexe A in the report which explains why.

3 RESULTS: MAIN FINDINGS

Sample demographics

3.1 All of the regions across England were well covered in terms of respondents participating in the survey. The South East region contributed the greatest number of respondents, representing 20 per cent of the sample overall, followed by Greater London with 17 per cent and the North and North West with 14 per cent each. The Trent region (sic) contributed the lowest proportion with just 4 per cent.

3.2 The greatest proportion of respondents (36 per cent) qualified during the 1990s, with 29 per cent in the 1980's, 18 per cent in the 1970's and just 2 per cent in the 1960's. No respondents in the survey qualified prior to 1960. Respondents were 61 per cent male and 39 per cent female[3].

3.3 Respondents worked in practices of varying sizes, most commonly with three to four full time equivalent partners, but varying from single practitioners to practices with 15 or more full time equivalents. The majority of respondents, 83 per cent, were not working in a dispensing practice, compared with 17 per cent who were.

Main results

3.4 Full results are presented below, showing the prevailing list price at the time the study was conducted, the product's true ranking, and the ranking awarded by respondents. Note well that in all cases 1 represents the most expensive, 2 next most expensive and so on. The reader should refer back to Table 2.1 above for full details including strengths and pack sizes.

3.5 An initial appreciation of how well rankings were awarded can be obtained by comparing the true rank with the average awarded, and also by observing how many practitioner awarded the correct rank.

[3] The Royal College of General Practitioners issued an information sheet in July 2006 on the profile of UK general practitioners. The profile of respondents is consistent with RCGP estimates that female doctors now represent 40 per cent of the GP workforce in England.

Table 3.1: Drug price ranking questions: full results

Group				Rank awarded						
Proton Pump Inhibitors		**Price**	**True Rank**	**1**	**2**	**3**	**4**			**Average**
Omeprazole	Losec	£29.22	1	144	146	250	460			3.03
Lanzoprazole	Zoton	£23.63	2	90	243	441	226			2.80
Rabeprazole	Pariet	£21.16	3	217	413	215	155			2.31
Esomeprazole	Nexium	£18.50	4	549	198	94	159			1.86
Statins				**1**	**2**	**3**	**4**			**Average**
Simvastatin	Zocor	£29.69	1	215	28	60	697			3.24
Pravastatin	Lipostat	£27.61	2	83	433	415	69			2.47
Atorvastatin	Lipitor	£18.03	3.5	103	423	423	51			2.42
Rosuvastatin	Crestor	£18.03	3.5	599	116	102	183			1.87
ACE Inhibitors and A II Receptor Antagonists				**1**	**2**	**3**	**4**	**5**	**6**	**Average**
Losartan	Cozaar	£18.09	1	161	165	173	290	143	68	3.29
Valsartan	Diovan	£16.44	2	240	232	212	129	85	102	2.89
Irbesartan	Aprovel	£12.57	3	186	215	260	189	89	61	2.96
Perindopril	Coversyl	£10.95	4	73	145	109	141	416	116	4.03
Enalapril	Innovace	£10.53	5	148	54	35	44	140	579	4.71
Candesartan	Amias	£9.89	6	192	189	211	207	127	74	3.11
SSRI Antidepressants				**1**	**2**	**3**	**4**			**Average**
Escitalopram	Cipralex	£14.91	1	732	56	39	173			1.65
Fluoxetine	Prozac	£14.21	2	174	71	124	631			3.21
Paroxetine	Seroxat	£13.21	3	60	413	440	87			2.55
Citalopram	Cipramil	£8.97	4	34	460	397	109			2.58
Other Antidepressants				**1**	**2**	**3**				**Average**
Venlafaxine	Efexor	£14.91	1	284	288	428				2.14
Mirtazapine	Zispin	£14.21	2	270	391	339				2.07
Reboxetine	Edronax	£13.21	3	446	321	233				1.79
Non-Steroidal Anti-Inflammatory Drugs				**1**	**2**	**3**				**Average**
Etoricoxib	Arcoxia	£22.96	1	599	246	155				1.56
Celecoxib	Celebrex	£21.55	2	189	615	196				2.01
Meloxicam	Mobic	£9.30	3	212	139	649				2.44

3.6 One simple way of getting a better appreciation of how well practitioners were able to rank drugs according to price is to focus on the pair-wise comparisons that can be made using the ranking data. These pair-wise comparisons look at each pair of drugs and determine if the respondent correctly identified which was more expensive or not.

3.7 This approach is simple to understand, and has the advantage that it is proportionate - major errors in ranking will generate lots of incorrect pair-wise comparisons, correct ranking will generate none or very few. It also facilitates looking at how well doctors performed for specific pairs of drugs and subgroups of the original group. This approach is adopted in the table below, and is also used for the additional analyses presented below.

3.8 Note that the number of pair-wise comparisons increases in a non linear way as the number of drugs in the group increases. Groups with three drugs give rise to three pair-wise comparisons, groups with four drugs give rise to six pair-wise comparisons, and groups with six drugs give rise to fifteen pair-wise comparisons.

3.9 The statistical tests shown in the table are fully explained in section seven. While the overall results are about what would be expected by chance in most of the individual groups results were significantly better or worse than would be expected by chance.

Table 3.2: Drug price ranking: pair-wise comparisons

Drug group	No. drugs in group	Correct	Out of	Per cent correct	Significantly different from chance
Proton Pump Inhibitors	4	1948	6000	32%	Yes at 99% level
Statins	4	1557	5000	31%	Yes at 99% level
ACE Inhibitors and A II Receptor Antagonists	6	8485	15000	57%	Yes at 99% level
SSRI Antidepressants	4	3418	6000	57%	Yes at 99% level
Other Antidepressants	3	1258	3000	42%	Yes at 99% level
Non-Steroidal Anti-Inflammatory Drugs	3	2130	3000	71%	Yes at 99% level
All pair-wise comparisons		18796	38000	49%	No
Supplementary information					
ACE Inhibitors	2	688	1000	69 %	Yes at 99% level
A II receptor antagonists	4	2916	6000	49 %	No

3.10 It is reasonable to argue that the ability to successfully rank drugs in order of price may depend to some degree on the price difference between the drugs, and would be harder where two drugs were similar or very similar in price. The data was therefore re-analysed to test sensitivity to the presence of equal and nearly equal prices. Results are shown in table 4.3 below, eliminating in turn comparisons for any pairs of drugs where the price of the more expensive exceeded that of the less expensive by no more than five per cent and by no more than ten per cent.

Table 3.3: Drug price ranking: pair-wise comparisons

Drug group	Pair-wise comparisons - % correct: Overall Excluding only pairs exactly equal in price	Excluding pairs ( ) less than 5% different in price	Excluding pairs ( ) less than 10% different in price
Proton Pump Inhibitors	32%	(0) 32%	(0) 32%
Statins	(1) 31%	(1) 31%	(2) 32%
ACE Inhibitors and A II Receptor Antagonists	57%	(1) 56%	(3) 59%
SSRI Antidepressants	57%	(1) 53%	(2) 59%
Other Antidepressants	42%	(1) 43%	(1) 43%
Non-Steroidal Anti-Inflammatory Drugs	71%	(0) 71%	(1) 72%
Overall	(1) 49%	(4) 48%	(9) 50%
Supplementary information			
ACE Inhibitors	69%	(1) - %	(1) - %
A II receptor antagonists	49%	(0) 49%	(0) 49%

Figures in brackets show numbers of pair-wise comparisons excluded

Ability of general practitioners to rank drugs by price: summary

3.11 As is apparent from tables above, the overall ability of practitioners to rank prices for the chosen selection of drugs approximately at a level that might have been achieved by chance. In table 4.1 it can be observed that the true ranking was only rarely the most popular choice.

3.12 The observed changes after eliminating comparisons where the prices of drugs were similar were small.

Factors that influence the ability to rank prices

3.13 Across the six groups, a total of 38 pair-wise comparisons can be made for each respondent. Out of this total, the number of correct assessments varied between a high of 34 correct our of 38 and a low of just 6 correct out of 38 with an overall average score of 18.8.

3.14 Results for each part of the questionnaire were examined to detect any results that had a significant influence on this score. Given the total number of tests conducted – approaching 100 - it would be expected that a proportion would prove significant, with possibly five results at the five per cent level and one result at the one per cent level expected. In the event six tests proved significant at the five per cent level and just two at the one per cent level.

3.15 These were closely examined but we do not consider that they imply any real group differences. For example, the difference in average score between men and women was significant at 3.6 per cent and with men averaging 19.0 and women 18.1, but this effect disappeared when considered jointly with graduate year group.

3.16 As a further example, the significant differences in average scores that depended on how frequently the respondent met drug company representatives looked potentially very important. However, the results did not tell a credible story – the pattern of better and poorer average scores was haphazard. Poorer scores were generally recorded by those respondents who met drug company representatives never or rarely. However, low scores were also apparent for those that met weekly, but high scores in the immediately adjacent categories to the weekly.

Table 3.4: Drug price ranking: pair-wise comparisons

How often do you see drug company reps?	Mean score	Standard Error of Mean
Never	18.5	0.33
Not in surgery but at external events	18.4	0.23
At least once every 12 months	18.4	0.61
At least once every 6 months	18.7	0.62
At least once every 3 months	19.2	0.31
Once a week to more than once a month	19.3	0.25
Once a week	18.5	0.31
Several times a week	20.1	0.67
Overall	18.8	

3.17 Overall, the data did not provide clear evidence of a systematic relationship between group characteristics and ability to rank drug prices. Such tests as proved significant were numerically roughly in line with expectations and did not appear to reflect any real underlying relationships. The results presented below in table 3.5 illustrate the uniform average scores for a number of potentially important influences, and the absence of any statistically significant influences on practitioners skills in ranking drugs in order of price.

Table 3.5: Drug price ranking: absence of significant effects on practitioner's ability to rank drug prices

Prescribing overspend is serious	**Mean score**	**Standard error about mean**
Strongly agree	19.1	0.38
Agree	18.7	0.19
Neither agree nor disagree	19.0	0.22
Disagree	18.7	0.27
Strongly disagree	18.4	0.60
Personal skills appraising prescribing information		
Always feel confident	18.8	0.56
Usually feel confident	19.0	0.16
Sometimes feel confident	18.5	0.21
Rarely feel confident	18.8	0.69
None of the above	17.6	1.02
Relationship with prescribing advisor		
Poor	18.4	0.35
Reasonable	18.7	0.19
Good	18.9	0.21
Excellent	19.2	0.29
PCT has a prescribing incentive scheme		
Yes	18.8	0.15
No	19.2	0.36
Don't know	18.4	0.24

3.18 To conclude this section we comment on two specific issues of interest. We found no evidence that doctors from dispensing practices had scores any different to doctors from non dispensing practices. Those from dispensing practices scored an average of 18.6 compared with others who scored 18.8. This difference was not statistically significant

3.19 The use of different prescribing software also had no significant influence on average scores. Full details are presented below.

Table 3.6: Drug price ranking: absence of influence form prescribing software on practitioner's ability to rank drug prices

	Average score	
Clinical software	**Non users**	**Users**
EMIS	18.8	18.8
inPractice INPS Vision	18.8	18.8
iSoft TOrex	18.8	18.6
Healthy Software Crosscare	18.8	20.7
Pheonix SystemOne	18.8	18.1
Other	18.8	19.4

Examination of price ranking results by group

3.20 Within the six groups of drugs used in the survey, some contained one or more drugs where generic alternatives were available. However, there did not appear to be any consistent relationship between the presence of generic alternatives and the ability of respondents to rank prices.

Table 3.7: Drug price ranking: presence of generic alternatives

Drug group	No. drugs in group	No of drugs with generic alternatives	Correct
Proton Pump Inhibitors	4	2	32%
Statins	4	2	31%
ACE Inhibitors and A II Receptor Antagonists	6	1	57%
SSRI Antidepressants	4	3	57%
Other Antidepressants	3	1	42%
Non-Steroidal Anti-Inflammatory Drugs	3	1	71%

3.21 Nevertheless, a more detailed group by group examination did suggest that certain features about drug prices might have influenced the results. In particular, there were cases where the difference in price between the branded drugs in the questionnaire and their generic alternatives was large, and at the same time the off patent brand was the most expensive in the group. These cases appeared to be associated with poorer results and are discussed more fully below.

Statins

3.22 In this group, at the time the survey was conducted, Zocor was at £29.69, whereas generic alternative forms of simvastatin cost just £1.48. This situation appeared to have a strongly negative influence on the ability of respondents to correctly rank Zocor. Its correct ranking was 1st (most expensive) out of 4, but in the study 70 per cent of respondents ranked it 4th out of 4. These results were systematically wrong and considerably worse than guesswork.

3.23 It should be recalled that the question included the specific instruction, '*Please do not consider the price of generics*'. It seems therefore that many respondents believed (wrongly) that when the drug went off patent and was subject to generic competition, the price of the branded drug fell in response. This misperception is replicated to a certain extent in all of the therapeutic groups we considered, as discussed below.

3.24 Another potential factor influencing the results in this group was the presence of another drug (Lipostat) with a substantial gap between the price of the branded drug (£27.61) and its generic alternative, pravastatin priced at £4.59. A full list of prices applicable at the time of the survey is given below. Tables 3.8 to 3.13 repeat price information already provided in Table 3.1 above, but with the addition of concurrent prices for generic alternatives.

3.25 Throughout this and the following sections the prices of generic drugs were those applicable shortly before the survey was undertaken. They were sourced on-line from the British National Formulary one to two weeks prior to the launch of the survey.

Table 3.8: Drug prices at the time of the survey: statins

Included in the survey questions	Price
Simvastatin (Zocor)	£29.69
Pravastatin (Lipostat)	£27.61
Atorvastatin (Lipitor)	£18.03
Rosuvastatin (Crestor)	£18.03
Generic alternatives	
Pravastatin (Generic)	£4.59
Simvastatin (Generic)	£1.48

3.26 In terms of the true rankings Lipostat would have correctly been placed 2nd, whereas any respondent confusing the branded drug price with generic prices might be assumed to have placed it 3rd. In the event a large proportion of respondents (85 per cent) awarded the branded drug either a ranking of 2nd (43 per cent) or 3rd (42 per cent), so the effect of any confusion appears to have been limited.

3.27 Overall, based on pair-wise comparisons, respondents were able to rank just 31per cent of the drugs in this group correctly.

Proton pump inhibitors

3.28 This group of drugs contained four members of which two were branded drugs with generic alternatives. Structurally this was a very similar situation to the Statin group. The most expensive branded drug (Losec) cost £29.22 at the time of the survey, but its alternative generic (Omeprazole) at £9.67 was less expensive than any of the other branded drugs on the list.

3.29 Note that the UK patents on Lansoprazole in capsule form containing enteric coated granules expired towards the end of 2005. This was the form specified in the survey questions, but note also that additional patents on Lansoprazole as FasTabs (that is in the form of orodispersible tablets) remain in place.

Table 3.9: Drug prices at the time of the survey: proton pump inhibitors

Included in the survey questions	Price
Omeprazole (Losec)	£29.22
Lansoprazole (Zoton)	£23.63
Rabeprazole (Pariet)	£21.16
Esomeprazole (Nexium)	£18.50
Generic alternatives	
Omeprazole (Generic)	£9.67
Lansoprazole (Generic form as capsules enc E/C granules)	£6.73

3.30 Much the same behaviour was observed. While not apparent to the same degree, nevertheless more respondents awarded Losec the rank of 4th out of four than any other category. This and the mistaken view that Nexium (Esomeprazole) was most expensive rather than its actual position as 4th most expensive out of 4, were major factors contributing to the overall rather poor results for this group. Also contributing to the overall result, Lansoprazole 2nd most expensive of the four brands was most commonly ranked 3rd of four. Based on pair-wise comparisons, respondents achieved just 32 per cent correct.

Selective serotonin re-uptake inhibitors

3.31 This group of drugs contained four members in all, three of which were branded drugs with generic alternatives. Each of the generic alternatives was cheaper than its branded competitor, and all generics were cheaper than the cheapest branded alternative within the group. A full list of prices applicable at the time of the survey is given below.

Table 3.10: Drug prices at the time of the survey: selective serotonin re-uptake inhibitors

Included in the survey questions	Price
Escitalopram (Cipralex)	£14.91
Fluoxetine (Prozac)	£14.21
Paroxetine (Seroxat)	£13.21
Citalopram (Cipramil)	£8.97
Generic alternatives	
Paroxetine (Generic)	£6.96
Citalopram (Generic)	£2.80
Fluoxetine (Generic)	£1.38

3.32 This group too exhibited signs that knowledge of generic prices might have influenced results. The most expensive drug Cipralex, the only one in the group without a generic alternative, was correctly ranked 1st by 73 per cent of respondents. In contrast, the 2nd most expensive Prozac, and a drug with the least expensive generic alternative, was incorrectly ranked 4th out of four by a substantial proportion of respondents.

Other anti-depressants

3.33 This group of drugs contained three members in all, one of which was a branded drug with a generic alternative and priced at the time of the survey as shown below.

Table 3.11: Drug prices at the time of the survey: other anti-depressants

Included in the survey questions	Price
Venlafaxine (Efexor)	£39.03
Mirtazapine (Zispin)	£19.19
Reboxetine (Edronax)	£18.91
Generic alternatives	
Mirtazapine (Generic)	£12.33

ACE inhibitors and angiotensin II receptor antagonists

3.34 This group of drugs contained six members in all, one of which was a branded drug with generic alternatives. In the event, the branded drug was one of the cheaper alternatives in the group namely 5th out of six. In consequence, any potential confusion between the branded drug Innovace and its generic alternative Enalapril might be expected to have only limited effect on the results.

Table 3.12: Drug prices at the time of the survey: ACE inhibitors and angiotensin II receptor antagonists

Included in the survey questions	Price
Losartan (Cozaar)	£18.09
Valsartan (Diovan)	£16.44
Irbesartan (Aprovel)	£12.57
Perindopril (Coversyl)	£10.95
Enalapril (Innovace)	£10.53
Candesartan (Amias)	£9.89
Generic alternatives	
Enalapril (Generic)	£1.38

3.35 It was observed that a high proportion of respondents (58 per cent) ranked Innovace as 6th out of six, rather than 5th, and this is consistent with previous observations. However, the overall effect of this would be to generate four correct pair-wise comparisons out of five involving this branded drug, rather than five out of five.

3.36 In this group of six drugs each respondent generates 15 pair-wise comparisons so, as mentioned above, the effect of confusing 5th and 6th place will not generate a strong influence on the results. Overall, based on pair-wise comparisons, respondents achieved 57 per cent correct in this group.

Non-steroidal anti-inflammatory drugs

3.37 This group of drugs contained three members, one of which had generic alternatives.

Table 3.13: Drug prices at the time of the survey: non-steroidal anti-inflammatory drugs

Included in the survey questions	Price
Etoricoxib (Arcoxia)	£22.96
Celecoxib (Celebrex)	£21.55
Meloxicam (Mobic)	£9.30
Generic alternatives	
Meloxicam (Generic)	£8.95

Examination of price ranking results by group: discussion

3.38 Two specific examples where groups contained a high priced branded drug with a much cheaper generic alternative produced very poor results. The best result was obtained in a group where only one generic alternative was present, and where the price of the branded version was similar in magnitude to the branded medicine.

3.39 One group contained three drugs with generic alternatives available, and this might have been expected to lead to confusion and poor results. However, the ranking of the prices of the generic alternatives were such that the effects of any confusion might have been ameliorated to some degree. Two of the cheaper generic alternatives were available for drugs that in their branded form were already 3rd and 4th cheapest out of four.

3.40 In one group of six drugs, where just one of the branded forms had a generic alternative the branded form was already 5th out of six. Potential confusion between this and a much cheaper generic alternative might therefore be limited to some tendency to rate this 6th rather than 5th.

3.41 Overall the evidence suggest substantial proportions of prescribers believed that off-patent brands had the lowest price in the group, when just one off-patent brand was present in the group, and occupied the lowest available positions where more than one off-patent brand was present in the group.

Table 3.14: Drug price ranking of off-patent branded drugs

Drug	Generic alternative	True rank	Off-patent branded drugs in group	Low ranking awarded	By percentage of practitioners
Losec	Omeprazole	1st of 4	2	4th of 4	*46%*
Zoton	Lansoprazole	2nd of 4	2	3rd of 4	*44%*
				4th of 4	*22%*
Zocor	Simvastatin	1st of 4	2	3rd of 4	*6 %*
				4th of 4	*70 %*
Lipostat	Pravastatin	2nd of 4	2	3rd of 4	*42 %*
				4th of 4	*7 %*
Prozac	Fluoxetine	2nd of 4	3	2nd of 4	*7 %*
				3rd of 4	*12 %*
				4th of 4	*63 %*
Seroxat	Paroxetine	3rd of 4	3	2nd of 4	*41 %*
				3rd of 4	*44 %*
				4th of 4	*9 %*
Cipramil	Citalopram	4th of 4	3	2nd of 4	*46 %*
				3rd of 4	*40 %*
				4th of 4	*11 %*
Zispin	Mirtazapine	2nd of 3	1	3rd of 3	*34 %*
Innovace	Enalapril	5th of 6	1	6th of 6	*58 %*

4 CONCLUSIONS

4.1 Practitioners' abilities to rank drug prices proved limited and overall – for the drugs in this survey - proved no better than might be expected from random selection. The ability to rank prices was not unduly influenced by the presence of drugs with similar prices. Eliminating these from the analysis resulted in only marginal improvements.

4.2 Practitioners' abilities to rank drug prices did vary between the different groups they were asked to consider. In several groups they did significantly better than would be expected by chance and in others significantly worse.

4.3 Looking at individual groups of drugs suggested that in groups where branded drugs had generic alternatives, this sometimes contributed to the difficulty of making correct ranking assessments.

4.4 The results suggest that practitioners may have systematic perception that off-patent brands have the lowest prices in the therapeutic groups. They therefore appear to believe that when a drug goes off patent, it lowers its price in response to generic entry. This effect is most visible where the off-patent brand is in fact the most expensive in the group.

4.5 Looking at the ability to rank prices in relation to the other questions in the survey, we found no compelling evidence that any specific group of doctors that could be identified from the questions in this survey were better or worse at ranking prices than others.

5 ATTACHMENT: NAO QUESTIONNAIRE

This survey was conducted on-line, so while the material presented below is an exact representation of the contents of the survey it cannot exactly represent the format on the on-screen material.

Year of qualification

(Check one)

- ☐ pre 1960
- ☐ 1960 - 1969
- ☐ 1970 - 1979
- ☐ 1980 - 1989
- ☐ 1990 - 1999
- ☐ 2000+

How many FTE partners are there in your practice?

(Type text)

Is the practice that you work in a dispensing practice?

(Check one)

- ☐ Yes
- ☐ No

What proportion of your consultations over the last year would you estimate resulted in a pharmaceutical prescription?

(Check one)

- ☐ Don't know
- ☐ 0-25%
- ☐ 26-50%
- ☐ 51-75%
- ☐ 76-100%

To what extent do you agree with the following statement?
'If my prescribing causes an overspend in my practice's drugs budget, this is a serious problem.'

(Check one)

- ☐ Strongly agree
- ☐ Agree
- ☐ Neither agree nor disagree
- ☐ Disagree
- ☐ Strongly disagree

There are many sources of information about pharmaceutical prescribing. Generally, how useful do you find the sources listed below?

(Check one alternative per row)

	1 - not useful at all	2 - only slightly useful	3 - useful	4 - very useful
PCT local formulary	☐	☐	☐	☐
Joint formulary with local hospitals	☐	☐	☐	☐
PCT prescribing adviser/medicines management team	☐	☐	☐	☐
Newsletters from PCT prescribing adviser/medicines management team	☐	☐	☐	☐
NICE guidance on specific technologies (appraisals)	☐	☐	☐	☐
NICE clinical guidelines for specific conditions	☐	☐	☐	☐
National Service Frameworks and other Department of Health guidance	☐	☐	☐	☐
SMC guidance	☐	☐	☐	☐
Magazines e.g. Pulse, GP, Doctor	☐	☐	☐	☐
Scientific journals e.g. The Lancet, BMJ	☐	☐	☐	☐
Summary journals e.g. Drugs and Therapeutic Bulletin, Bandolier	☐	☐	☐	☐
Pharmaceutical company representatives	☐	☐	☐	☐
Pharmaceutical company literature (including advertisements)	☐	☐	☐	☐
BNF	☐	☐	☐	☐
MIMS	☐	☐	☐	☐
Consultants	☐	☐	☐	☐
Practice nurses	☐	☐	☐	☐
GPs	☐	☐	☐	☐
Area prescribing committee	☐	☐	☐	☐
Guidance from professional organisations	☐	☐	☐	☐
Prodigy	☐	☐	☐	☐
Professional web based resources	☐	☐	☐	☐
London New Drugs Group	☐	☐	☐	☐
Other - please specify	☐	☐	☐	☐

There are many sources of information about pharmaceutical prescribing. Generally, how objective do you find the sources listed below?

(Check one alternative per row)

	1 - not objective	2 - generally not objective	3 - generally objective	4 - objective	N/A
PCT local formulary	☐	☐	☐	☐	☐
Joint formulary with local hospitals	☐	☐	☐	☐	☐
PCT prescribing adviser/medicines management team	☐	☐	☐	☐	☐
Newsletters from PCT prescribing adviser/medicines management team	☐	☐	☐	☐	☐
NICE guidance on specific technologies (appraisals)	☐	☐	☐	☐	☐
NICE clinical guidelines for specific conditions	☐	☐	☐	☐	☐
National Service Frameworks and other Department of Health guidance	☐	☐	☐	☐	☐
SMC guidance	☐	☐	☐	☐	☐
Magazines e.g. Pulse, GP, Doctor	☐	☐	☐	☐	☐
Scientific journals e.g. The Lancet, BMJ	☐	☐	☐	☐	☐
Summary journals e.g. Drugs and Therapeutic Bulletin, Bandolier	☐	☐	☐	☐	☐
Pharmaceutical company representatives	☐	☐	☐	☐	☐
Pharmaceutical company literature (including advertisements)	☐	☐	☐	☐	☐
BNF	☐	☐	☐	☐	☐
MIMS	☐	☐	☐	☐	☐
Consultants	☐	☐	☐	☐	☐
Practice nurses	☐	☐	☐	☐	☐
GPs	☐	☐	☐	☐	☐
Area prescribing committee	☐	☐	☐	☐	☐
Guidance from professional organisations	☐	☐	☐	☐	☐
Prodigy	☐	☐	☐	☐	☐
Professional web based resources	☐	☐	☐	☐	☐
London New Drugs Group	☐	☐	☐	☐	☐
Other - please specify	☐	☐	☐	☐	☐

What proportion of all the prescribing information that you have received over the last year do you estimate that you have read?

(Check one)

- ☐ Don't know
- ☐ 0-25%
- ☐ 26-50%
- ☐ 51-75%
- ☐ 76-100%

Thinking about your personal skills in appraising prescribing information, there may be ways you would like to improve. Please tick the statement that best describes your situation

(Check one)

- ☐ I always feel confident in appraising prescribing information
- ☐ I usually feel confident in appraising prescribing information
- ☐ I sometimes feel confident in appraising prescribing information
- ☐ I rarely feel confident in appraising prescribing information
- ☐ None of the above (please explain)

In what form do you find it useful to receive information about prescribing?

(Check all that apply)

- ☐ In person
- ☐ At a seminar or conference
- ☐ By email
- ☐ In an academic publication featuring trial results such as Lancet or New England Journal of Medicine
- ☐ In a summary publication such as Drugs and Therapeutic Bulletin or Bandolier
- ☐ Other (please specify)

Which clinical software do you use?

(Check all that apply)

- ☐ EMIS
- ☐ inPractice / INPS/ Vision
- ☐ iSoft / Torex
- ☐ Healthy Software / Crosscare
- ☐ The Phoenix Partnership / SystmOne
- ☐ Other, please specify

Does the prescribing software you use display advertisements or promotional information from pharmaceutical or devise manufacturers?

(Check one)

- ☐ Yes
- ☐ No
- ☐ Don't know

What do you consider the role of a prescribing advisor to be?
Please rank the following activities in order of priority with 1 being the highest and 9 being the lowest.

- ☐ Providing support and advice to GPs on current issues in prescribing
- ☐ Providing support and advice to GPs on cost efficient prescribing
- ☐ Providing support and advice to GPs on implementing NICE guidance
- ☐ Analysing data and identifying areas for improvement
- ☐ Providing support and advice to other prescribers
- ☐ Providing support and advice to other primary care clinicians who influence prescribing
- ☐ Horizon scanning to identify future issues
- ☐ Working to influence prescribing in secondary care
- ☐ Providing support on commissioning in relation to medicine

How would you describe your relationship with your prescribing adviser?

(Check one)

- ☐ Poor
- ☐ Reasonable
- ☐ Good
- ☐ Excellent

Does your PCT have a prescribing incentive scheme?

(Check one)

- ☐ Yes
- ☐ No
- ☐ Don't know

How much is your PCT's prescribing incentive scheme worth to your practice each year? Please note that this does not refer to QOF medicines management points.

(Check one)

- ☐ £0-1000
- ☐ £1001-2000
- ☐ £2001-4000
- ☐ £4001-6000
- ☐ £6001-8000
- ☐ £8001-10000
- ☐ More than £10000
- ☐ Don't know

Does your PCT's prescribing incentive scheme incentivise you to stay within budget?

(Check one)

- ☐ Often
- ☐ Sometimes
- ☐ Rarely
- ☐ Never
- ☐ Don't know

Is your practice part of the GMS contract?

(Check one)

- ☐ Yes
- ☐ No

Please give your response to the statements below about the GMS contract QOF points and your prescribing decisions.

(Check one alternative per row)

	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
QOF incentives have caused an	☐	☐	☐	☐	☐

increase in my prescribing.					
QOF points have made my prescribing more efficient.	☐	☐	☐	☐	☐
QOF points have not had any impact upon my prescribing.	☐	☐	☐	☐	☐

Do you consider patient demands for drugs to have increased over the past three years?

(Check one)

☐ Yes
☐ No
☐ Don't Know

Is your practice's prescribing behaviour benchmarked against others through means such as PACT data?

(Check one)

☐ Yes
☐ No
☐ Don't know

Does such benchmarking data influence your prescribing decisions?

(Check one)

☐ Often
☐ Sometimes
☐ Rarely
☐ Never
☐ Don't know

How often do you see drug company reps?

(Check one)

☐ Never
☐ Not in my surgery but may encounter them at external events
☐ At least once every 12 months
☐ At least once every 6 months
☐ At least once every 3 months
☐ Less than once a week but more than once a month
☐ Once a week
☐ Several times a week

Please tick the statement below that you most agree with about the influences upon GP prescribing behaviour in general.

(Check one)

☐ The pharmaceutical companies have much more influence than prescribing advisers
☐ The pharmaceutical companies have slightly more influence than prescribing advisers
☐ Pharmaceutical companies and prescribing advisers are roughly equivalent in their influence
☐ Prescribing advisers have slightly more influence than pharmaceutical companies
☐ Prescribing advisers have much more influence than pharmaceutical companies

What arrangements do you have in place for managing prescriptions that originate in hospital but are dispensed in the primary sector?

(Type text)

Do you believe that practice based commissioning will encourage your practice to make savings in your drugs bill?

(Check one)

- ☐ Yes, significant savings
- ☐ Yes, small savings
- ☐ Don't know
- ☐ No

Have you taken any steps to reduce wastage generated by unnecessary repeat prescribing and dispensing, patient non-concordance and non-standardised pack sizes in your area?

(Check one)

- ☐ Yes, please specify
- ☐ No

We are interested in understanding how clearly and consistently information on branded drug prices is signalled to you (by suppliers, PCT's and other parties) among all the other information about drugs that you receive.

Each of the six groups of drugs to follow contains lines from the same or related Sections of the BNF. Each individual branded drug is listed in the presentation and pack size that would constitute a 'typical' monthly course of treatment. Drugs are listed by alphabetical order of chemical name.

For each of the groups, it would help us if you could attempt to rank the drugs – in the brands, presentations and pack sizes shown – in order of the most expensive (1) to the least expensive, without referring to any price lists. Please do not consider the prices of generics.

Lastly, you are asked which drug from each group you prescribe most often in practice. Please include any drugs not mentioned in the lists below, for example generics.

Rank *Proton Pump Inhibitors* in order of the most expensive (1) to the least expensive (4), without referring to any price lists.
Please do not consider the prices of generics.

(Check all that apply)

- ☐ Esomeprazole (Nexium), Tablets, 20 mgs, 28 pack
- ☐ Lanzoprazole (Zoton), Capsules enc. E/C granules, 30 mgs, 28 pack
- ☐ Omeprazole (Losec), Capsules enc. E/C granules, 20 mgs, 28 pack
- ☐ Rabeprazole (Pariet), EC Tablets, 20mgs, 28 pack

Which *PPI* do you prescribe most often in practice (and please state if you prescribe the brand or generic)?

(Type text)

Rank *Statins* – in order of the most expensive (1) to the least expensive (4), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- ☐ Atorvastatin (Lipitor), Tablets, 10 mgs, 28 pack
- ☐ Pravastatin (Lipostat), Tablets, 40 mgs, 28 pack
- ☐ Rosuvastatin (Crestor), Tablets, 10 mgs, 28 pack
- ☐ Simvastatin (Zocor), Tablets, 20 mgs, 28 pack

Which *Statin* do you prescribe most often in practice (and please state if you prescribe the brand or generic)?

(Type text)

Rank *ACE Inhibitors and AII Receptor Antagonists* – in order of the most expensive (1) to the least expensive (6), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- ☐ Candesartan (Amias),Tablets, 8 mgs, 28 pack
- ☐ Enalapril (Innovace),Tablets, 10 mgs, 28 pack
- ☐ Irbesartan (Aprovel),Tablets, 150 mgs, 28 pack
- ☐ Losartan (Cozaar),Tablets, 50 mgs,28 pack
- ☐ Perindopril (Coversyl),Tablets, 4mgs, 30 pack
- ☐ Valsartan (Diovan),Capsules, 80 mgs,28 pack

Which *ACE Inhibitor/AII Receptor Antagonist* do you prescribe most often in practice (and please state if you prescribe the brand or generic)?

(Type text)

Rank *SSRI Antidepressants* – in order of the most expensive (1) to the least expensive (4), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- ☐ Citalopram (Cipramil), Tablets, 10 mgs, 28 pack
- ☐ Escitalopram (Cipralex), Tablets, 10 mgs, 28 pack
- ☐ Fluoxetine (Prozac), Capsules, 20 mgs, 30 pack
- ☐ Paroxetine (Seroxat),Tablets, 20 mgs, 30 pack

Which *SSRI* do you prescribe most often in practice (and please state if you prescribe the brand or generic)?

(Type text)

Rank *Other antidepressants* – in order of the most expensive (1) to the least expensive (3), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- ☐ Mirtazapine (Zispin) , SolTabs, 30 mgs, 30 pack
- ☐ Reboxetine (Edronax), Tablets, 4 mgs, 60 pack
- ☐ Venlafaxine (Efexor), Tablets, 75 mgs, 56 pack

Which of these drugs do you prescribe most often in practice (and please state if you prescribe the brand or generic)?

(Type text)

Rank *Non-Steroidal Anti-Inflammatory Drugs* - in order of the most expensive (1) to the least expensive (3), without referring to any price lists. Please do not consider the prices of generics.

(Check all that apply)

- ☐ Celecoxib (Celebrex), Capsules, 200 mgs, 30 pack
- ☐ Etoricoxib (Arcoxia), Tablets, 60 mgs, 28 pack
- ☐ Meloxicam (Mobic), Tablets, 7.5 mgs, 30 pack

Which *NSAID* do you prescribe most often in practice (and please state if you prescribe the brand or generic)?

(Type text)

What one factor would help to improve your prescribing decision-making?

(Type text)

In which one of the following regions do you work?

(Check one)

- ☐ Greater London
- ☐ South East (Kent, Surrey, Sussex, Hampshire, Isle of Wight, Berks, Bucks, Oxfordshire, Northants)
- ☐ South West (Avon, Gloucestershire, Wiltshire, Somerset, Dorset, Devon, Cornwall, Isles of Scilly)
- ☐ Northern (Northumberland, Durham, Cleveland, North Yorkshire, West Yorkshire Humberside)
- ☐ North West (Cumbria, Merseyside, Lancashire, Greater Manchester, Cheshire)
- ☐ West Midlands (Birmingham, Worcestershire, Warwickshire, Staffordshire, Shropshire)
- ☐ Trent (South Yorkshire, Nottinghamshire, Derbyshire, Lincolnshire, Rutland, Leicestershire)
- ☐ Eastern (Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk, Suffolk)

Please select your gender:

(Check one)

- ☐ Male
- ☐ Female

Definition of English regions

Greater London	
South East	Kent, Surrey, Sussex, Hampshire, Isle of Wight, Berks, Bucks, Oxfordshire, Northants
South West	Avon, Gloucestershire, Wiltshire, Somerset, Dorset, Devon, Cornwall, Isles of Scilly
Northern	Northumberland, Durham, Cleveland, North Yorkshire, West Yorkshire Humberside
North West	Cumbria, Merseyside, Lancashire, Greater Manchester, Cheshire)
W. Midlands	Birmingham, Worcestershire, Warwickshire, Staffordshire, Shropshire
Trent	South Yorkshire, Nottinghamshire, Derbyshire, Lincolnshire, Rutland, Leicestershire
Eastern	Bedfordshire, Cambridgeshire, Essex, Hertfordshire, Norfolk, Suffolk

6 ATTACHMENT: STATISTICAL NOTES

6.1 This short section explains the statistical tests that are used to conclude that the results presented in table 4.2 are significantly better or worse than could be arrived at by chance.

6.2 Each respondent is asked to rank a number of drugs in each group. Depending on the number of drugs in the group, the following table shows the total number of different possible rankings, and the total number of possible pair-wise comparisons.

Table 6.1: Possible number of pair-wise comparisons for different group sizes

	Number of items to be ranked (that is number of drugs in group)			
	Three	**Four**	**Five**	**Six**
Number of possible pair-wise comparisons	3	6	10	15
Number of different rankings possible	6	24	120	720

6.3 Now of all the possible different rankings given in the second row of the above table, just one will generate a full set of correct pair-wise comparisons, some will generate many correct pair-wise comparisons, some an average number, some few, and again just one no correct pair-wise comparisons. Table 6.2 below sets out in full the number of rankings that generate different numbers of correct pair-wise comparisons. We omit the case for five drugs since this no group of this size was used in the survey.

6.4 Now if rankings were being done purely at random, each of the different rankings would be equally likely. So table 6.2 can be used to calculate the average number and the variability of correct pair-wise comparisons that would arise if choices were made purely at random, and these results are shown in table 6.3.

6.5 Table 6.3 also shows how these results can be scaled to assess the overall score and its variability when these results are scaled up to the full sample of 1000 respondents. Since the original distributions are symmetric and single peaked, we can rely on the central limit theorem to conclude that the distribution of the sum of 1000 independent cases will be normally distributed.

Table 6.2: Number of correct pair-wise comparisons resulting from all possible rankings

Number of items to be ranked (that is number of drugs in group)					
Three		**Four**		**Six**	
Number of correct pair-wise comparisons	**Cases**	**Number of correct pair-wise comparisons**	**Cases**	**Number of correct pair-wise comparisons**	**Cases**
None correct	1	None correct	1	None correct	1
1 correct	2	1 correct	3	1 correct	5
2 correct	2	2 correct	5	2 correct	14
All 3 correct	1	3 correct	6	3 correct	29

		4 correct	5	4 correct	49
		5 correct	3	5 correct	71
		All 6 correct	1	6 correct	90
				7 correct	101
				8 correct	101
				9 correct	90
				10 correct	71
				11 correct	49
				12 correct	29
				13 correct	14
				14 correct	5
				All 15 correct	1
All cases	6		24		720

6.6 In consequence, we can set confidence intervals about the total score for 1000 independent cases, based on the normal distribution. Table 7.3 below demonstrates that for a group of three drugs any score greater 1578 or less than 1422 has only a 1 per cent probability of arising by chance. Similarly for groups of four drugs the same conclusion would apply for scores greater than 3120 and less than 2880 and for groups of six drugs for scores greater than 7716 and less than 7284.

6.7 Not presented in the table below are the slightly modified calculations for the group where two drugs had equal prices so the pair-wise comparisons for that specific pair were excluded from the results. For this group the expected score that would result from chance selection is 2500 with variance 1916.7.

6.8 Finally we can set a confidence interval for all the pair-wise comparisons arising form each of the six groups of drugs. The groups are independent and there is no covariance between the results for separate groups. We can simply sum the appropriate variances to arrive at an overall estimate. There are three groups of drugs with four members (with allowance for the case mentioned in the paragraph above), two groups with three members and a single group with six members.

6.9 The combined total score for all 1000 participants has an expected value of 18,000 from chance selection with variance 15,167. So results that exceeded 19,241 or fell below 18,759 would be statistically significantly different from chance.

Table 6.3: Statistics of randomly chosen rankings

Number of correct pair-wise comparisons	Number of items to be ranked (that is number of drugs in group)		
Each respondent	**Three**	**Four**	**Six**
Expected value	1.5	3.0	7.5
Variance	0.9167	2.1667	7.0833
Sum of 1000 independent respondents			
Expected value of total	1500	3000	7500
Variance	916.7	2166.7	7083.3
Standard deviation about total	30.3	46.5	84.2
95% confidence interval	± 59	± 91	± 165
Upper 95%	1559	3091	7665
Lower 95%	1441	2909	7335
99% confidence interval	± 78	± 120	± 216
Upper 99%	1578	3120	7716
Lower 99%	1422	2880	7284