

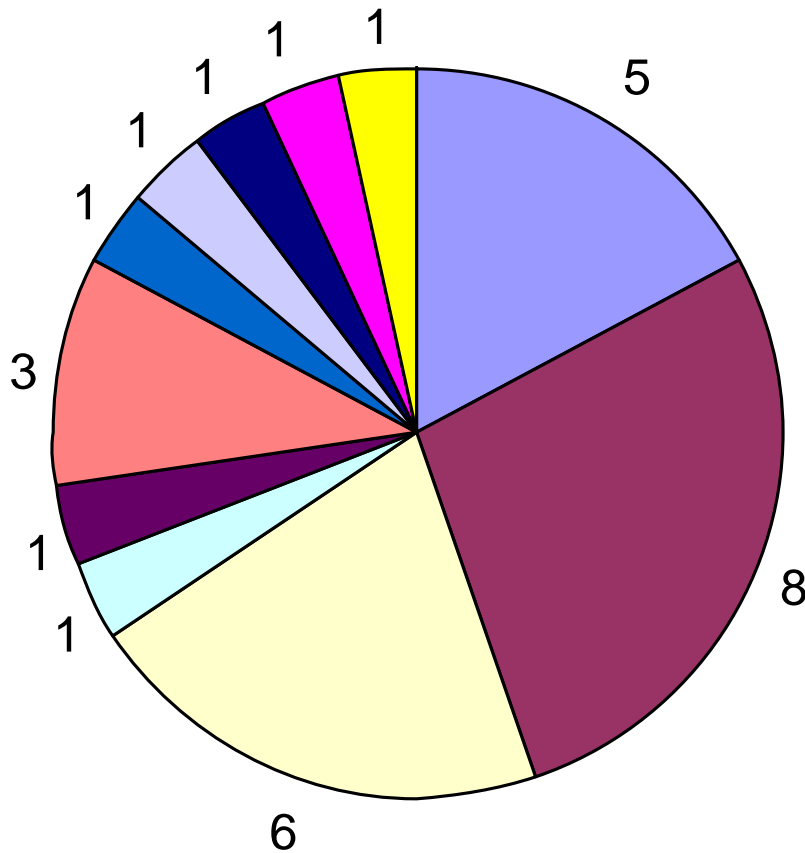
Audit of Liver function tests

Audit conducted on behalf of the Thames Audit Group

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Q1. What tests constitute your a) GP LFT profile ?



- a) ALT, BR, ALP, Alb
- b) ALT, BR, ALP, TP, Alb
- c) ALT, BR, ALP, TP, Alb, Glob
- d) ALT, BR, ALP, GGT, Alb
- e) ALT, BR, ALP, GGT, TP, Alb
- f) ALT, BR, ALP, GGT, TP, Alb, Glob
- g) ALT, BR, ConjBR, ALP, Alb
- h) AST, BR, ALP, TP, Alb, Glob
- i) AST, ALT, BR, ALP
- j) AST, ALT, BR, ALP, Alb
- k) AST, BR, ALP, Alb



**Q1. What tests constitute your
b) In-patient LFT profile ?**

26 Same profile for in-patient as for GP

2 Removed one analyte from the GP profile

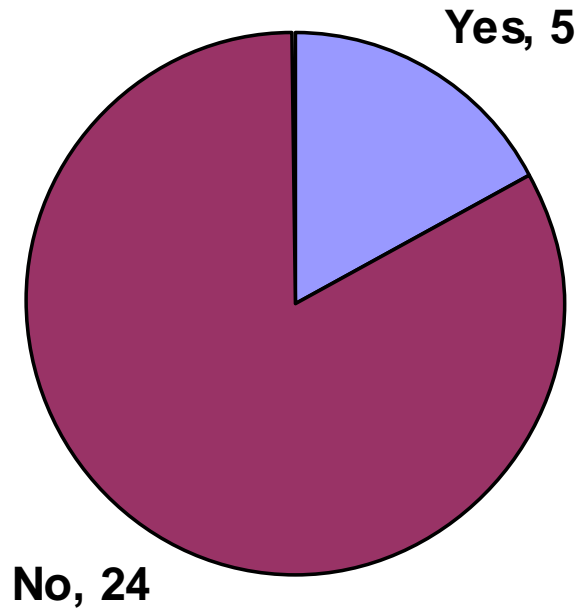
- GGT**
- TP**

1 Added GGT to the GP profile

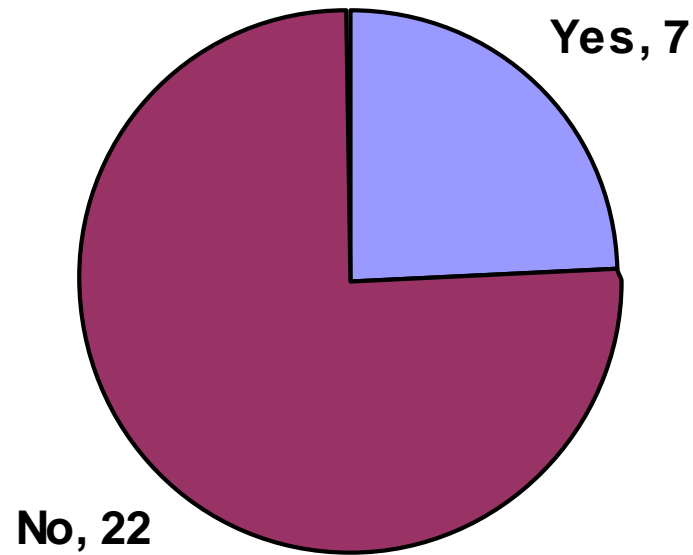
Q1c). If not in profile available on request ?

Test	GP	In-patient	Available on request ?
AST	4	4	22
ALT	27	27	2
Bilirubin (Total)	29	29	0
Conjugated bilirubin	1	1	28
Unconjugated bilirubin	0	0	13
ALP	29	29	0
GGT	5	3	26
Total serum protein	18	17	11
Serum albumin	28	28	1
globulins	10	10	8
LDH	0	0	28

● ● ● | **Q2. Do you have a protocol for the investigations of Gilbert's syndrome ?**



● ● ● | **Q3. Do you have a protocol for the monitoring of LFTs in paracetamol overdose ?**





Q3. Do you have a protocol for the monitoring of LFTs in paracetamol overdose ?

If Yes, please enclose the protocol, record where the protocol is kept

A&E 2

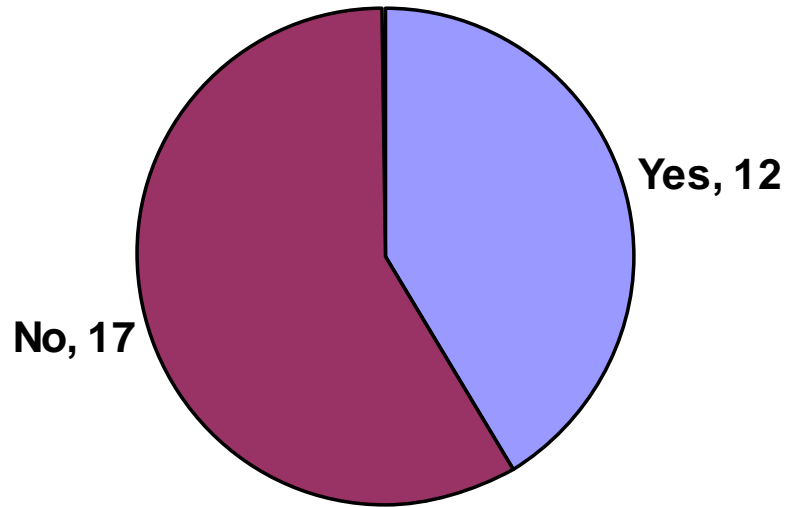
A&E + Laboratory 2

A&E + Trust intranet 1

Trust intranet link to BNF on-line calculator 1

Refers them to Toxbase 1

● ● ● | **Q4. Have you held discussions with your clinicians regarding general LFTs policy ?**





Q5. Do you add interpretative comments to LFT results ?

- **Yes** **1**
- **No** **14**
- **Sometimes. Please specify.....** **14**

Examples

- Elevated globulins, electrophoresis added
- Raised TBIL/low BILC ? Gilberts.
- AST is raised but other liver markers are not, possible muscle origin CK added.
- ALP is persistently elevated, isoenzyme studies added.

- To abnormal GP results.
- Advice GP's / clinician's on telephone.



Q6. What tests do you offer for the investigation of haemochromatosis?

Are they performed in house or referred ?

Are they available for GPs and Hospital patients ?

Test	offered	In-house	referred	GP	Hospital
Transferrin saturation	29	25	4	28	29
Ferritin	29	29	0	28	29
DNA analysis for C282Y	27	5	22	19	27



Tests for Haemochromatosis

Q7. What is the criteria for accepting these tests ?

- **7 None**
- **22 Had criteria**

Q8. Do you have an age range for offering these tests ?

- **10 29 No**



Q9. What tests do you offer for the investigation of Wilson's disease?

- **Caeruloplasmin (Cp) only** **1**
- **Copper (Cu) & Cp** **17**
- **Cu, Cp and DNA** **2**
- **Cu, Cp and free Cu Cal** **5**
- **Cu, Cp, free Cu Cal and DNA** **3**
- **Cp followed by 24hr Urine Cu estimation** **1**

Q9. What tests do you offer for the investigation of Wilson's disease?

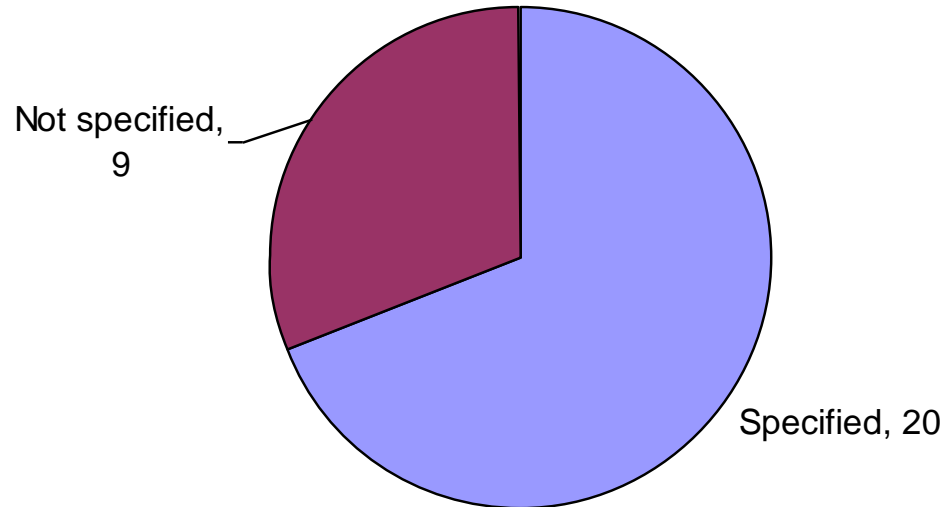
Are they analysed in house or referred?

Are they available for GPs and Hospital patients?

Test	Available	In house	referred	GP	Hospital
Copper only					
Caeruloplasmin only	2	1	1	2	2
Both Cu & Cp	27	Cu = 7 Cp = 11	21 16	25	27
Free Copper calculation	8	1	7	6	8
DNA analysis for ATP7B	5	0	5	2	5

Tests for Wilson's disease

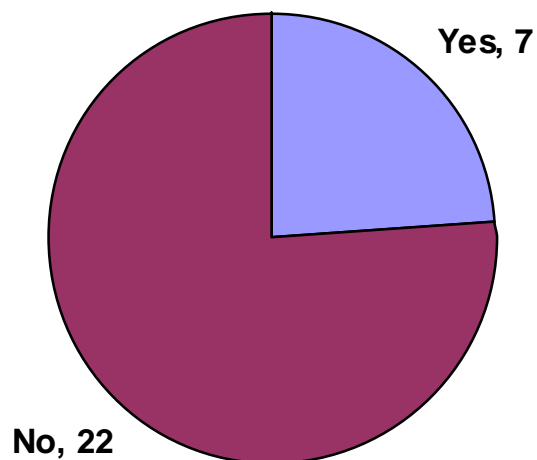
Q10. What is the criteria for accepting these tests ?



- 5 Requested by / discussed with gastroenterologists / hepatologist / consultant
- 5 Abnormal LFTs with clinical details
- 1 Cu & Cp only analysed if prev abnormal LFTs on 2 occasion >3months apart
- 1 Cu & CP freely available
- 3 Cp available on request
- 5 Cu only if
 - Cp below ref range
 - Not re-analysed within 2 months
- 2 DNA analysis discussed with clinician prior to sending.
- 2 CRP of <10mg/L

Tests for Wilson's disease

Q11. Do you have an age range for offering these tests ?



<40yrs	2
<45yrs	1
<50yrs	1
<60yrs	1
<65yrs	2

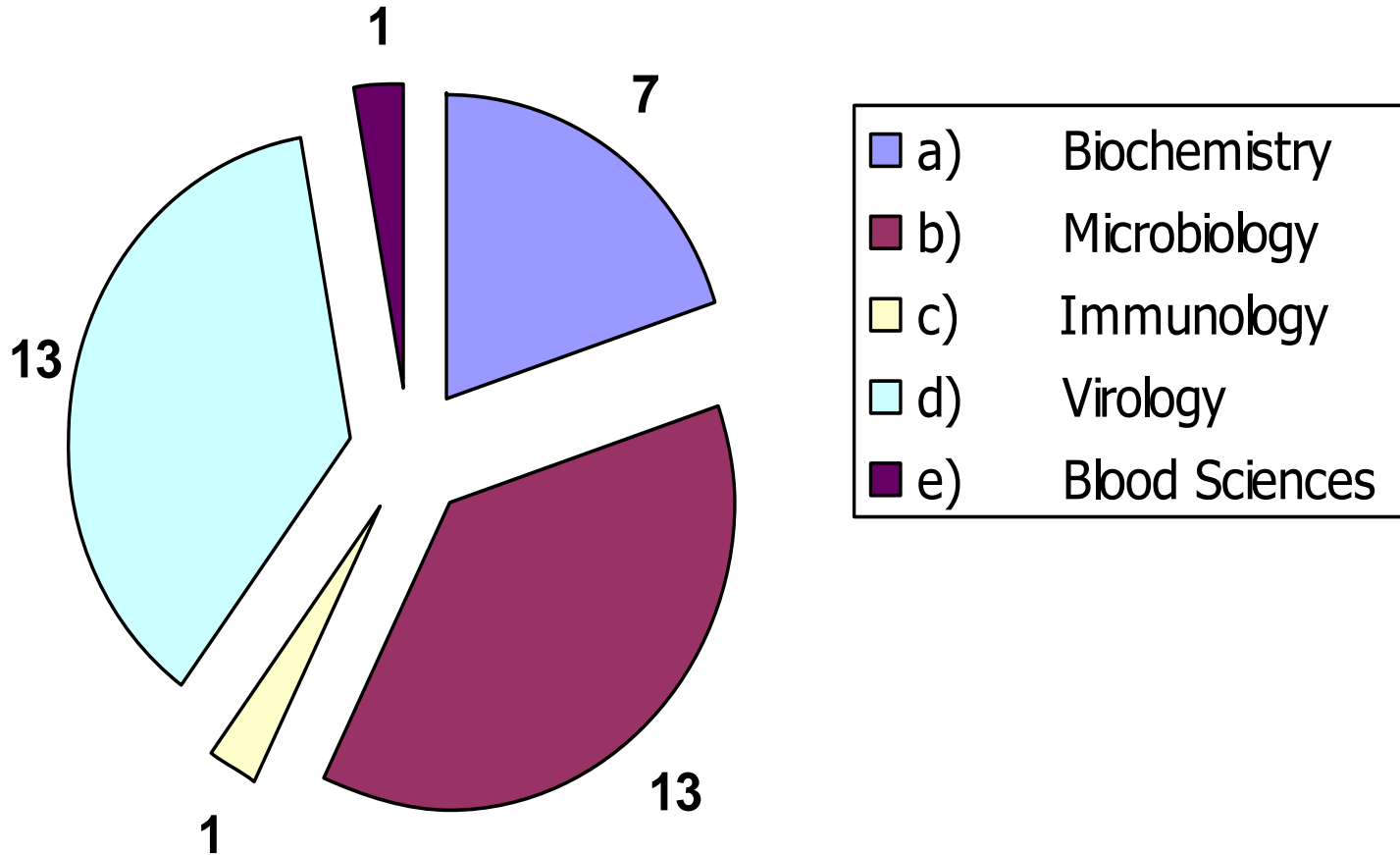


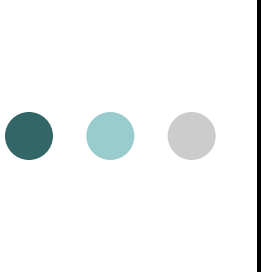
Q12. What tests are offered when a hepatitis screen is requested ?

- 5 LFT's in Biochemistry other unknown tests in other departments**
- 4 No Standard screen, test done as requested or in discussion with clinician**
- 7 Hep Ab & Ag's dependent on clinical info received (e.g. travel)**
- 5 Hep A, B, C (4), plus EBV (1)**
- 9 Hep B surface Ag, Hep C Ab's (3), plus Hep A IgM (4), plus Hep B core reflexed if Ag positive (2)**
- 2 Hep B, C serology plus viral load by PCR and genotype.**

Hepatitis serology

Q13. Which department are these tests performed in ?





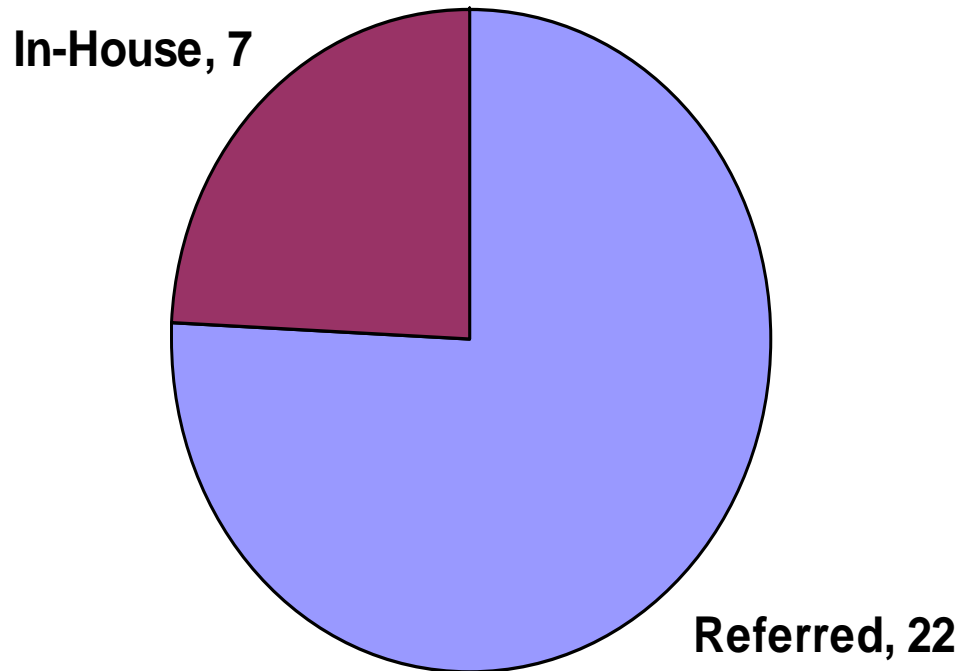
Q14. What further investigations do you recommend for a raised alkaline phosphatase in adults ?

What criteria do you use for analysing ALP isoenzymes in adults?

- **15 If ALP raised with normal GGT do isoenzymes by electrophoresis**
- **7 ALP, GGT, Isoenzymes**
- **2 GGT & heat inactivation**
- **2 LFT, GGT, bone profile – if GGT normal or if a liver source with additional bone suspected do isoenzymes**
- **2 ALP, GGT, Bone profile, Vit D, isoenzymes**
- **1 At the discretion of the duty biochemist**

Q15. What method (and analyser) do you use to measure ALP isoenzymes ?

Are these tests performed in-house or referred ?
if referred please state referral laboratory?



In-house

Sebia Hydrasys	5
Helena	1
Heat inactivation	1

Referral Laboratory

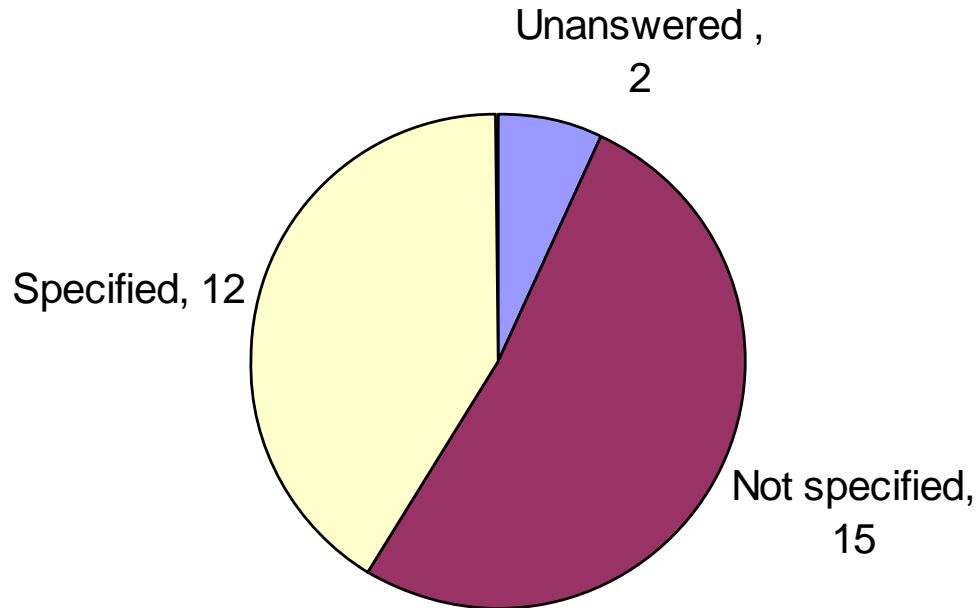
GOS	7
Royal free	5
St Mary's	5
King's	2
St. George's	1
Homerton	1
Unspecified location	1



Q16. Do you offer conjugated Bilirubin?

- a. In adults Yes = 29**
- b. In neonates Yes = 29**
- c. As reflex test Yes = 7 No = 22**

Q17. What limit of total bilirubin is used for conjugated bilirubin to be analysed in adults ?



- **8** **Between >20 - >30 umol/L**
- **1** **>40umol/L**
- **2** **>50umol/L**
- **1** **>100umol/L and only at clinician's request**



Q18. Do you offer Bile acids ?

a. **In obstetrics;**

Yes = 28

No = 1

b. **In adults other than obstetrics;**

Yes = 7

No = 20

Unknown = 1

c. **In children**

Yes = 10

No = 17

Unknown = 1

1 answered possibly after discussion



Q19. Do you offer the following tumour markers

a) AFP ?

Who is allowed to request this test ?	Cut-off level	Interpretation supplied
Not restricted = 14	3-12	No = 13
Gp's & Clinicians = 6	None = 11	Yes = 3
Hospital Dr = 3	Unknown = 1	Gp's only = 2
Consultant only = 1	Not stated = 8	Sometimes = 4
Consultant or monitoring = 1		Graphical reports = 1
Oncology /Gastro = 1		Ref range = 2
Not stated = 2		Not stated = 1

Q19. Do you offer the following tumour markers

b) CA19-9 ?

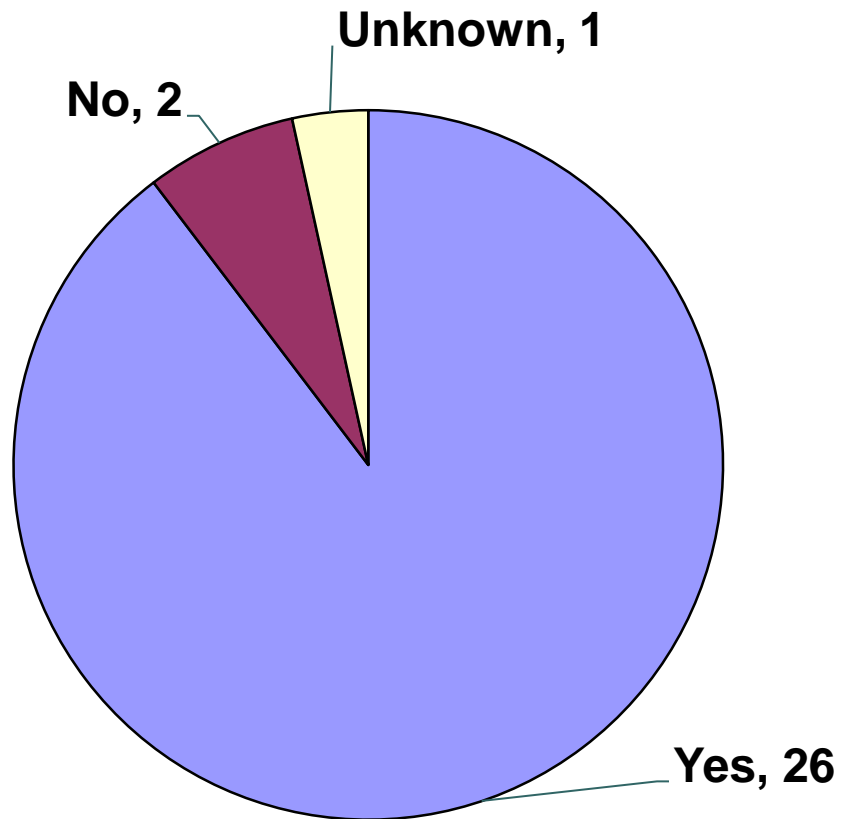
Who is allowed to request this test ?	Cut-off level	Interpretation supplied
Not restricted = 15	0.6U/ml = 1	No = 13
Gp's & Clinicians = 6	27-31Ku/L = 18	Yes = 2
Hospital Dr = 4	<60KU/L = 1	Gp's only = 1
Consultant only = 1	None = 2	Sometimes = 5
Oncology /Gastro = 1	Not stated = 5	Graphical reports = 1
Not stated = 2		Ref range = 2
		Not stated = 2

Q19. Do you offer the following tumour markers

c) CEA

Who is allowed to request this test ?	Cut-off level	Interpretation supplied
Not restricted = 14	0.5ng/ml = 1	No = 13
Gp's & Clinicians = 5	<2.5 to 8 ug/L = 16	Yes = 4
Hospital Dr = 4	34 = 1	Gp's only = 2
Consultant only = 1	36=1	Sometimes = 4
Consultant or monitoring = 1	None = 1	Graphical reports = 1
Colorectal /Oncology /Gastro = 1	Not stated = 8	Ref range = 2
Not stated = 1		Not stated = 2

Q20. Do you offer PIIINP as a marker of Fibrosis ?





Q21. Do you test for A1AT ?

•Yes = 28

•No = 1

Q22. What method and analyser do you use ?

- Referral 14**
- Roche Modular 3**
- Beckman Immage (nephelometry) 3**
- Dade Behring BN Prospec (nephelometer) 2**
- Abbott Architect (Immunoturbidimetry) 2**
- Olympus AU2700 (immunoturbidimetry) 2**
- In-house (unknown method) 1**
- BNII analyser (Nephelometry) 1**
- Unspecified 1**



Q23. Is the phenotype analysed in adults ?

a) Yes

0

b) Only if requested

13

(2 for Family studies,
11 if requested + A1AT < ref range)

c) Only as a reflex test from a low result ?

19

(if so, at what level?)

- Level unspecified 1
- Referral lab criteria 6
- A range of levels used (<0.5 - 1.5g/L) 12



Q24. If the phenotype is analysed, where is the test performed ?

- **No response** **2**
- **Referred** **27**

Referred

- **St. George's PRU** **10**
- **Sheffield PRU** **9**
- **PRU** **2**
- **Kings** **3**
- **Addenbrooke's** **1**
- **Queen Elizabeth Hospital, Woolwich** **1**
- **Birmingham Heartlands Hospital** **1**



Q25. What tests are offered when Autoimmune liver disease is requested ?

- a) Anti-mitochondrial Antibodies (AMAab)*
- b) Anti-nuclear antibodies (ANAab)*
- c) Anti-smooth muscle antibodies (ASMAb)*
- d) Others (please specify)*

- **AMAab, ANAab & ASMAb** **9**
- **AMAab, ANAab, ASMAb & LKMicro Abs** **7**
- **AMAab, ANAab, ASMAb & LKMicro Abs & Gastric parietal cell** **5**
- **AMAab & ASMAb** **1**
- **ANCA & ANF – others reflexed if positive** **1**
- **Refer to Immunology** **4**
- **Unknown** **1**
- **Not answered** **1**

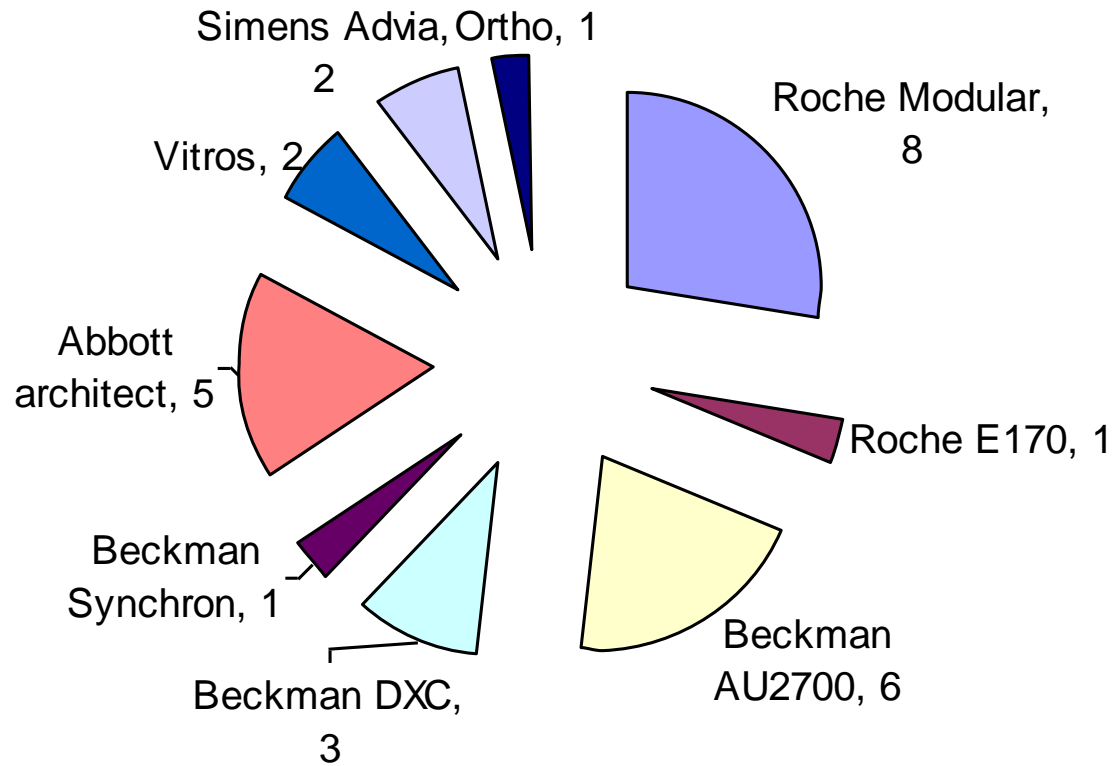
Q26. Which department are these tests performed in ?

- a) Biochemistry**
- b) Microbiology** **2**
- c) Immunology** **26**
- d) Blood Sciences**

Not answered = 1

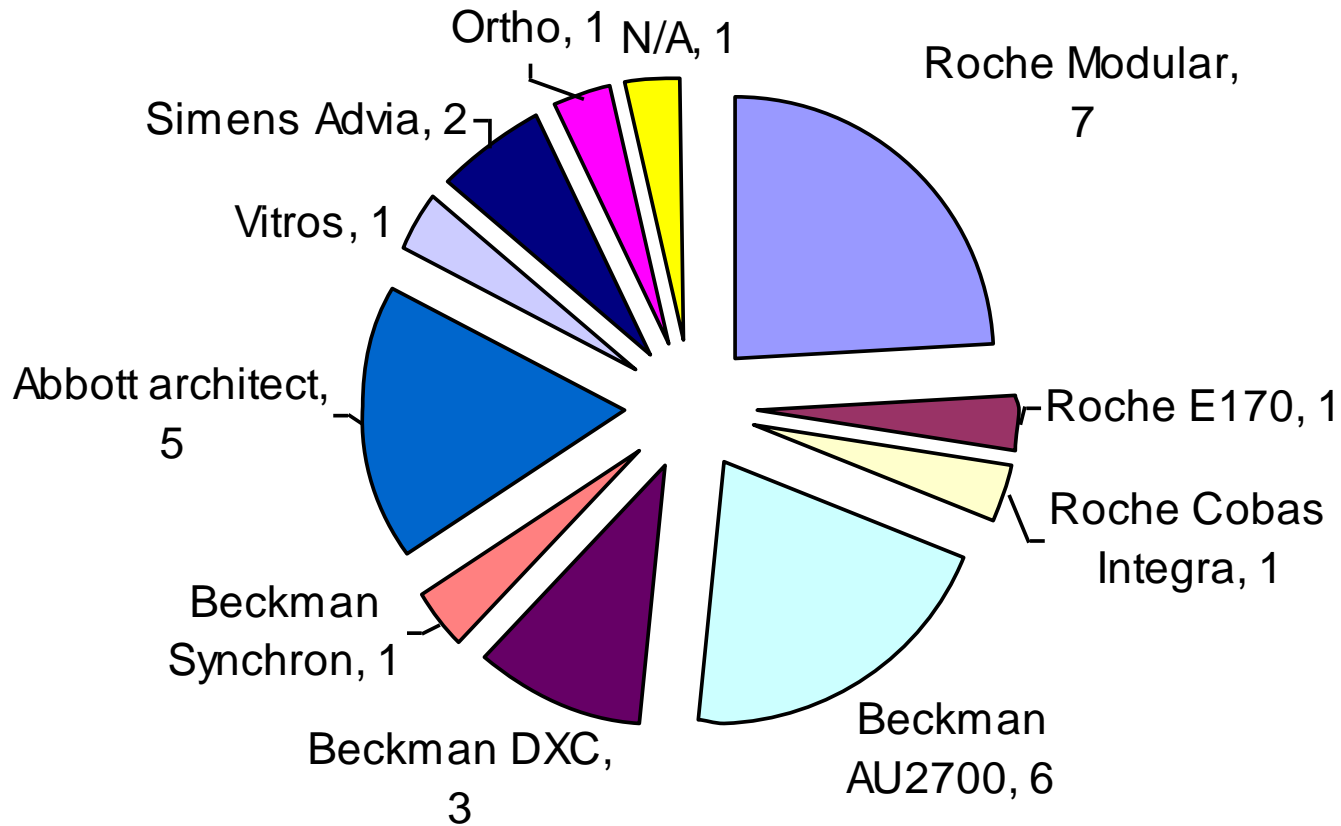
Q27. What method do you use to measure the analytes below;
Please state method used and main Analyser.

a) ALT



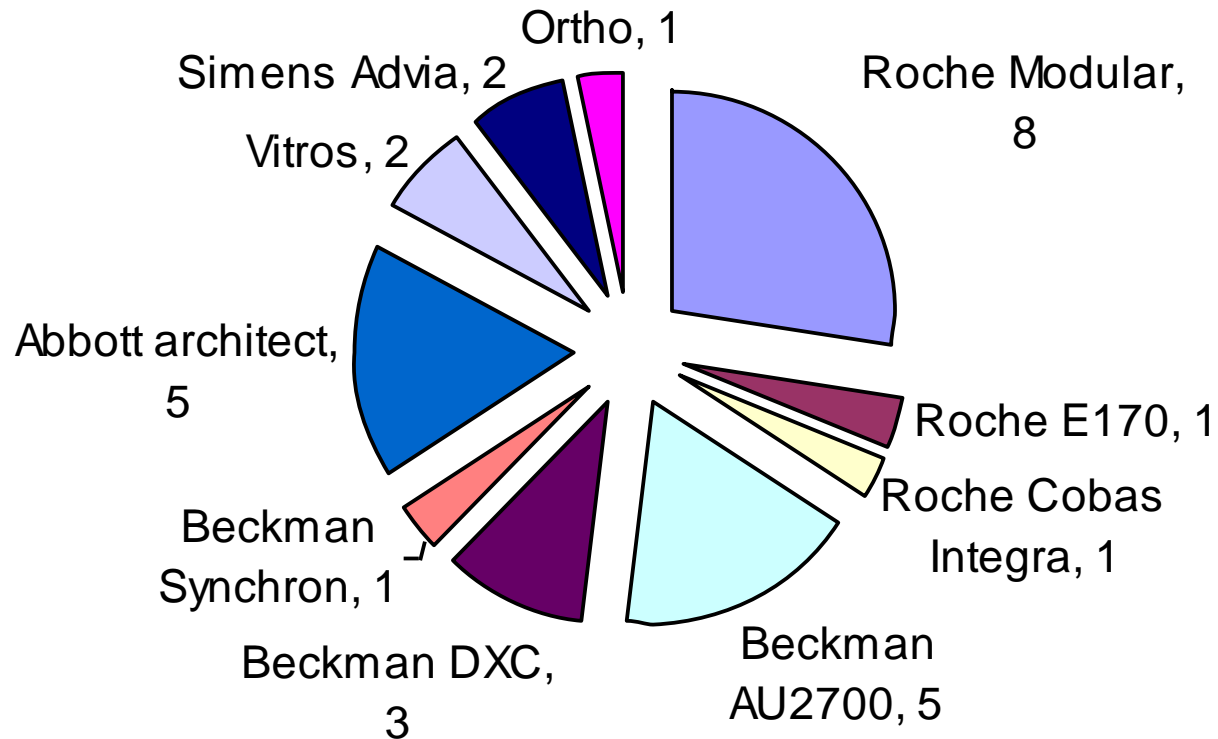
Q27. What method do you use to measure the analytes below;
Please state method used and main Analyser.

b) AST



Q27. What method do you use to measure the analytes below;
Please state method used and main Analyser.

C) LDH

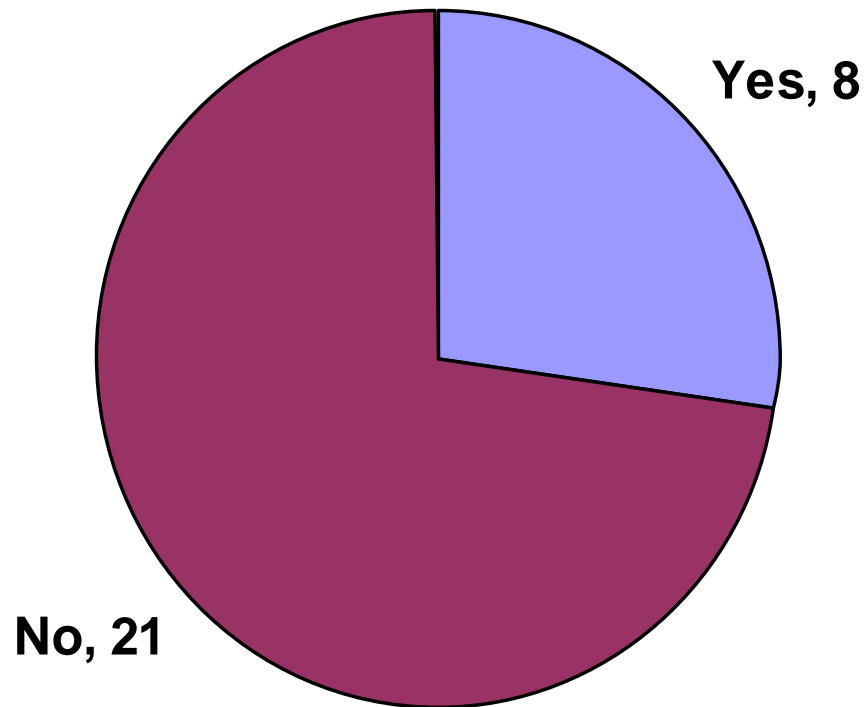


Q28. Adult LFT Action limits ?

Test	Action limit	units
AST	>250 – >2000 (n=9)	U/L
ALT	>180 – >1000 (n=13)	U/L
Bilirubin (Total)	>100 – >600 (n=10)	umol/L
Conjugated bilirubin	-	umol/L
Unconjugated bilirubin (estimated by subtraction)	-	umol/L
ALP	>500 - >2000 (n=2)	U/L
GGT	-	U/L
Total serum protein	>90 – >100 (n=3)	g/L
Serum albumin	<15 - <25 (n=3)	g/L
Calculated serum globulins	>45 - >50 (n=2)	g/L
LDH	600 – 700 (n=2)	U/L

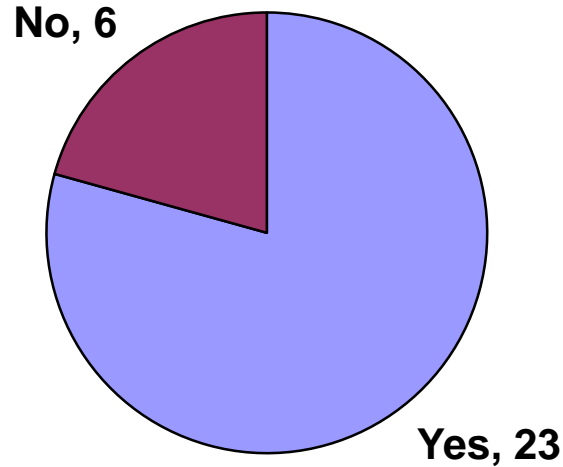
● ● ●

Q29. Does your laboratory reflex test for conjugated bilirubin based on an isolated raised serum bilirubin in GP population ?



● ● ●

**Q30. Do you reflex test for the following tests?
a) GGT ?**



**Q30. Do you reflex test for the following tests?
b) AST ?**

All responded with No



Summary of the audit findings-1

- The majority of laboratories
 - Included ALT, BR, ALP, Alb in their LFT profile
 - Had AST, Conj BR, GGT and LDH available on request
 - Didn't have a protocol for
 - the investigation of Gilbert's syndrome
 - monitoring LFTs in Paracetamol overdose
- More than half had held discussions with their clinician regarding general LFTs policy.
- The majority of laboratories offered Ferritin, TSat and DNA analysis for the investigation of haemochromatosis
- More than half had investigated Wilson's disease using both Cu & Cp
- The majority
 - Referred their Cu & Cp analysis
 - Had Cu & Cp available for GP's and hospital patients
 - Had criteria for accepting tests for Wilson's disease



Summary of the audit findings-2

- Large variation in the tests offered for hepatitis screening, with analysis split between biochemistry, microbiology and virology departments.
- Further investigations for a raised ALP in adults >50% stated If ALP was raised with normal GGT then isoenzymes would be analysed by electrophoresis
- All laboratories offered conjugated BR, but only a small proportion offered it as a reflex test
- All but one of the laboratories offered bile acids in obstetrics
- 50% of laboratories do not vet tumour marker requests, there are a wide variety of cut-offs used and a wide variation in providing interpretations.



Summary of the audit findings-3

- The majority of laboratories offer PIIINP as a marker of fibrosis
- The majority of laboratories
 - Test for A1AT
 - Analysed the A1AT phenotype in adults only if requested for family studies or reflexed from a low A1AT result
- Most laboratories referred the analysis of the A1AT phenotype
- The majority of laboratories offered a panel of tests which included AMAab, ANAab & AS Mab when autoimmune liver disease was requested
- There was a large range of action limits for AST, ALT, BR & ALP
- The majority of laboratories reflex test for GGT



Acknowledgements

Non-teaching (n=15)

- Ashford & St. Peters
- Barnet & Chase Farm NHS Trust
- Basildon
- East Kent Hospitals University NHS Foundation Trust
- East Sussex Hospitals (Eastbourne)
- Hemel Hempstead General Hospital, West Hert NHS Trust
- Kingston hospital NHS Trust
- Mid Essex Hospitals NHS Trust
- Maidstone & Tunbridge Wells NHS Trust
- Peterborough & Stamford Hospitals NHS Foundation Trust
- Princess Alexandra NHS Trust
- Royal Surrey County Hospital/Frimley Park Hospital NHS
- The Hillingdon Hospital
- Watford General
- Whittington

Teaching (n=11)

- Barking, Havering and Redbridge University Hospitals NHS Trust
- Barts & The London NHS Trust
- Brighton & Sussex Hospitals NHS Trust
- Epsom & St.Helier University Hospitals NHS Trust
- Guy's & St. Thomas' Hospital, GSTS Pathology
- Imperial College Healthcare NHS Trust – HHNT
- Imperial College Healthcare NHS Trust – Mary's
- Newham University Hospital NHS Trust
- Royal Free Hampstead NHS Trust
- Southend Hospital NHS Trust
- University College London Hospital

Associate teaching (n=2)

- Luton& Dunstable hospital foundation trust
- North Middlesex University Hospital NHS Trust

Tertiary referral centre (n=1)

- Royal Brompton & Harefield NHS Trust