Audit Report

Extended Community Care (ECC) – NT-proBNP testing

A National Audit of BNP testing in General Practice patients aged 65 years and older

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Irish College of GPs
Research, Policy & Information Department

Contents

1. Background

Healthcare systems that manage health issues at the earliest opportunity in primary care are more efficient and economical[1]. As life expectancy in the Republic of Ireland (ROI) continues to increase[2], numbers of older patients looked after in general practice also increases[3]. Patients aged over 70 years in ROI are entitled to free public healthcare through a General Medical Services (GMS) or Doctor-Visit Card (DVC) card. These patients attend their General Practitioner (GP) more than any other group, and understandably have the highest rates of chronic diseases[4]. The launch of the Health Service Executive (HSE) suite of Enhanced Community Care (ECC) measures in 2020, which included expanded access for GPs to NT-proBNP testing in ROI[5], seeks to assist GPs in caring for these patients in the community.

NT-proBNP has multiple cardiac functions and is released in response to a variety of cardiac stresses, but in particular to cardiac stretch that occurs as part of the disease process involved in heart failure (HF)[6]. While the prevalence of heart failure (HF) depends on the definition applied, approximately 1 to 2% of the adult population in developed countries suffer from the condition, and these rates rise to ≥10% of patients > 70 years of age[7]. Numerous prognostic markers of death and/or HF hospitalization have been identified in patients with HF. However, their clinical applicability is limited and precise risk stratification in HF remains challenging[8].

The severity of HF is usually classified into four classes defined by the New York Heart Association (NYHA) classification system[9]. Plasma NT-proBNP concentrations are

[1] Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. Milbank Q. 2005;83(3):457-502.

[2] Department of Health, Ireland. Key trends Report 2022.

[3] Department of Health, Ireland. Healthy Ireland survey 2022.

[4] Primary Care Reimbursement Service (PCRS) Open Data analyses on patient numbers by card type (Mar 2023).

[5] Department of Health, Ireland. "Minister for Health welcomes GP access to diagnostic services". 20th Jan 2021. Available at: https://www.gov.ie/en/press-release/40e62-minister-for-health-welcomes-gp-access-to-diagnostic-services/ (accessed 30th June 2024)

[6] HSE National Clinical Programme for Pathology- National Laboratory Handbook- Laboratory Testing for Natriuretic Peptides (NP). Lee G, Ryan M, Gallagher J. Published Nov 2021. Available at: https://www.hse.ie/eng/about/who/cspd/lsr/resources/natriuretic-peptide-testing-guideline1.pdf (accessed 11th July 2024)

[7] The Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC). 2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure. European Heart Journal. 37: 2129–2200.)

[8] A Scientific Statement from the American Heart Association (2017). Role of Biomarkers for the Prevention, Assessment, and Management of Heart Failure. Circulation. 135:1054–1091.)

[9] Cowie MR et al. (2003). Clinical applications of B-type natriuretic peptide (BNP) testing. European Heart Journal. 24: 1710 – 1718.

elevated in patients with HF in line with the NYHA class. Of note, for patients over 75 years of age, the upper limit of normal for NT-proBNP is considerably higher (450 ng/L) than that for younger patients, where the upper limit of the normal NT-proBNP range is 125 ng/L[10].

NT-proBNP testing primarily is useful in the differential diagnosis of dyspnoea and in identification of disease prevention strategies in high-risk patients[11,12].

This audit aims to understand the reasons behind use of NT-proBNP testing for older patients (>= 65 years of age) in Irish general practice in the first six months of 2024, and the clinical impact of these tests.

2. Methods

This audit involved a chart review by 10 general practitioners of NT-proBNP tests ordered in their respective clinics during the first six months of 2024. GPs were recruited from the HSE/Irish College of GPs (the 'College') Clinical Leads programme and through the College's member groups, in order to provide good geographical representation.

GPs were asked to review a maximum of 20 patient files and return anonymous data to the Irish College of GPs Research Department for analysis.

GPs were asked the following questions relating to each patient case who had a recent NT-proBNP test on file:

1) **"Indication for this NT-proBNP sample"**, with the following options presented:
    a. Registration visit for CDM programme
    b. Possible new diagnosis of heart failure
    c. Possible worsening heart failure

[10] HSE National Clinical Programme for Pathology- National Laboratory Handbook- Laboratory Testing for Natriuretic Peptides (NP). Lee G, Ryan M, Gallagher J. Published Nov 2021. Available at: https://www.hse.ie/eng/about/who/cspd/lsr/resources/natriuretic-peptide-testing-guideline1.pdf (accessed 11th July 2024)

[11] HSE National Clinical Programme for Pathology- National Laboratory Handbook- Laboratory Testing for Natriuretic Peptides (NP). Lee G, Ryan M, Gallagher J. Published Nov 2021. Available at: https://www.hse.ie/eng/about/who/cspd/lsr/resources/natriuretic-peptide-testing-guideline1.pdf (accessed 11th July 2024)

[12] Cowie MR et al. (2003). Clinical applications of B-type natriuretic peptide (BNP) testing. European Heart Journal. 24: 1710 – 1718.

d. Hospital request
e. Other

2) **"What would have happened to this patient if you didn't have access to NT-proBNP testing?""**, with the following options presented:
   i. No change in GP management
   ii. Patient sent for diagnostics/OPD ^/ECC ✧hub
   iii. Patient referred to ED */AMAU °
   iv. Other

^ Outpatients Department **✧ Extended Community Care**

*** Emergency Department** **° Acute Medical Assessment Unit**

3) **"Did this NT-proBNP result change patient management? (please select all that apply)"**, with the following options presented:
   I. Patient/GP reassurance (negative predictive value of test)
   II. Change in therapy or monitoring
   III. Led to referral for diagnostics
   IV. Led to referral to ECC Hub
   V. Led to referral to OPD
   VI. Led to Referral to ED/AMAU

Appendix 1 shows a screenshot of the Audit template file GPs were asked to complete.

3. Results

Audit returns on 192 NT-proBNP tests for patients aged 65 years plus were received from 10 GPs distributed across five HSE Health Regions (see Figure 1).

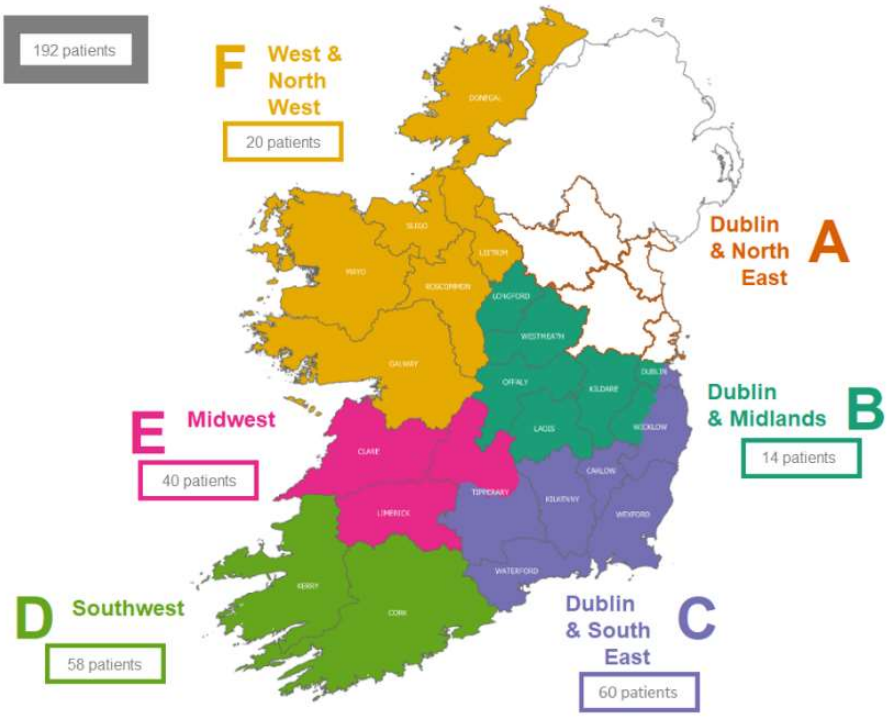

Figure 1- Returns from GPs by HSE Health Region

3.1 Patient characteristics

Figure 2 demonstrates the summary statistics of the patient charts reviewed, with an average age of 77.2yrs. There was an equal split of males and females in the sample.

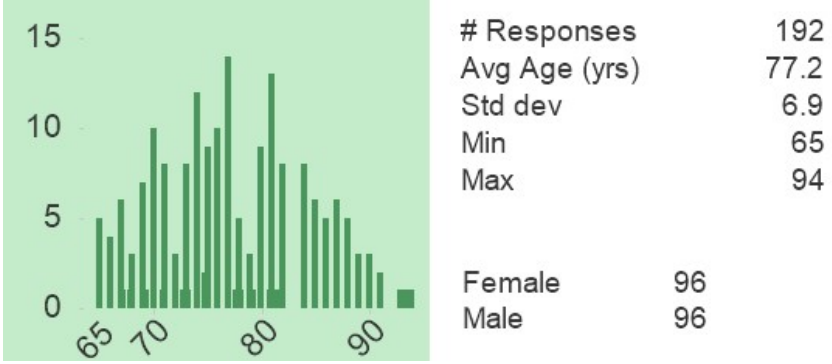

Figure 2- Patient characteristics

3.2 Indications for Testing

Figure 3 shows that 31% of NT-proBNP tests were requested as part of the HSE chronic disease management (CDM) programme, which involves testing NT-proBNP in advance of the registration treatment programme visit for all patients with diabetes and/or cardiovascular disease. Just over a third of tests were requested to assess the possibility of a new diagnosis of HF, with 17% relating to clinical suspicion of worsening HF. Six percent of requests were hospital requests facilitated in the GP clinics. Of note, the 22 (11%) of "Other" reasons provided by GPs centred on co-existent cardiovascular conditions, such as pulmonary hypertension, arterial hypertension and ischaemic heart disease.

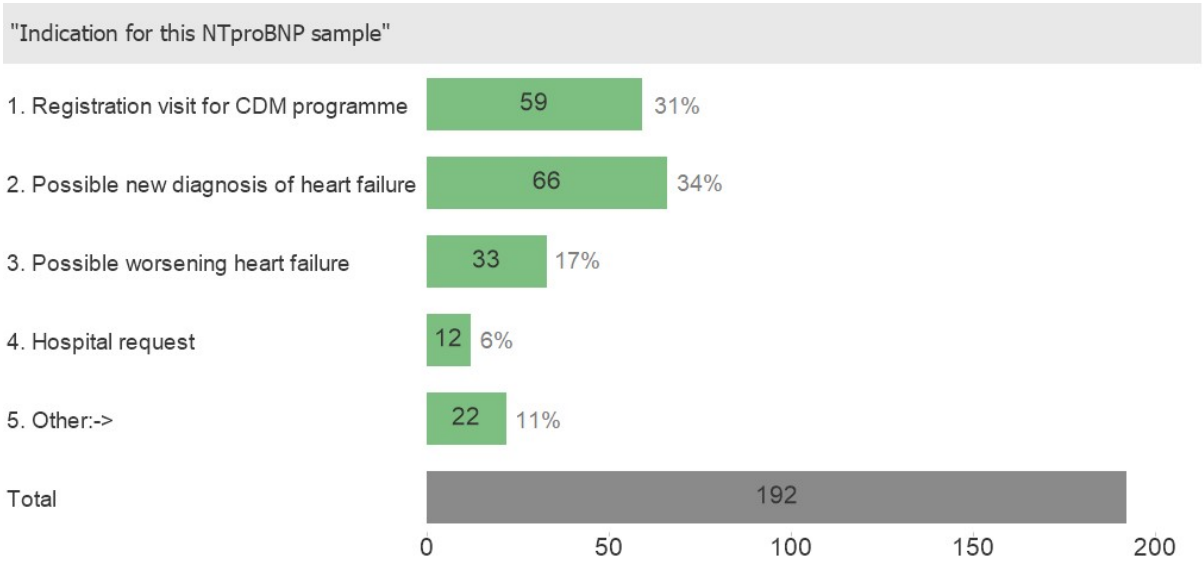

Figure 3 – Indication for NT-proBNP sample

3.3 NT-proBNP test values

As described in Section 1, reference ranges for NT-proBNP change depending on patient age. Thus, it is important to break down our patients according to their age group. Table 1 shows the breakdown of NT-proBNP values by age group for the 192 patients in our sample. Median NT-proBNP for the older patients was more than twice that for the younger patients, which underlines the relevance of the differing reference ranges depending on patient age.

	65-74yrs	75+yrs
Total count	74	118
Min	10	42
Max	2561	16296
Average	385.3	1,229.2
25%	73.25	161
Median	146	326
75%	425	942.5

Table 1- Summary statistics of NT-proBNP tests by age group

Figure 4 shows that more than half of the NT-proBNP values for those under 75 years of age were abnormally high while four out of ten for those aged 75 years plus were high. Larger rates of "High" values for younger patients can be partially explained by the lower upper bound of the reference range relevant to those aged < 75 years of age.

Taken as a group, the grey "Total" bar at the bottom of the chart shows that almost 45% of NT-proBNP results in this audit were abnormally high.

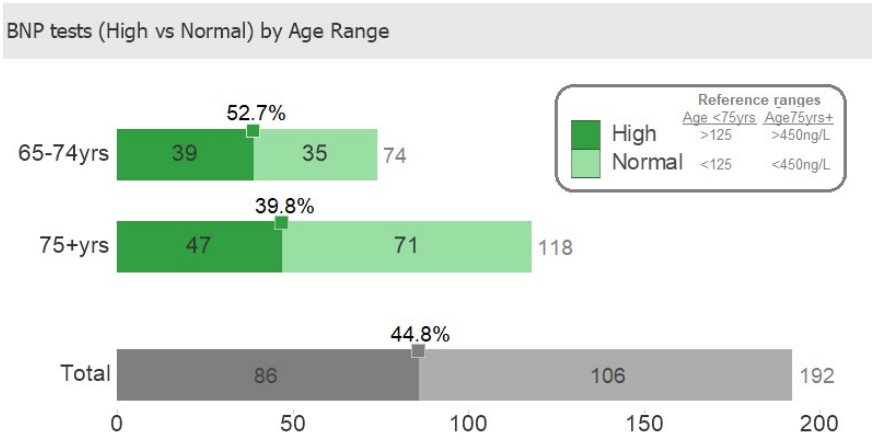

Figure 4- High and Normal Results by Age Range

3.4 Care without access to NT-proBNP

Figure 5 shows the summary of GP assessment of what would have happened without access to NT-proBNP testing for each patient in this audit.

While 49% would have continued with standard care in general practice, additional information would have been sought from diagnostic/outpatient/ECC services or

ED/AMAU in 44% of cases. GPs stated they would have sought further investigations from cardiology diagnostic services (chiefly echocardiogram), outpatient departments or extended community care hubs in 33% of cases. For more urgent clinical queries, 11% of patients would have been sent to an acute medical assessment unit or emergency department.

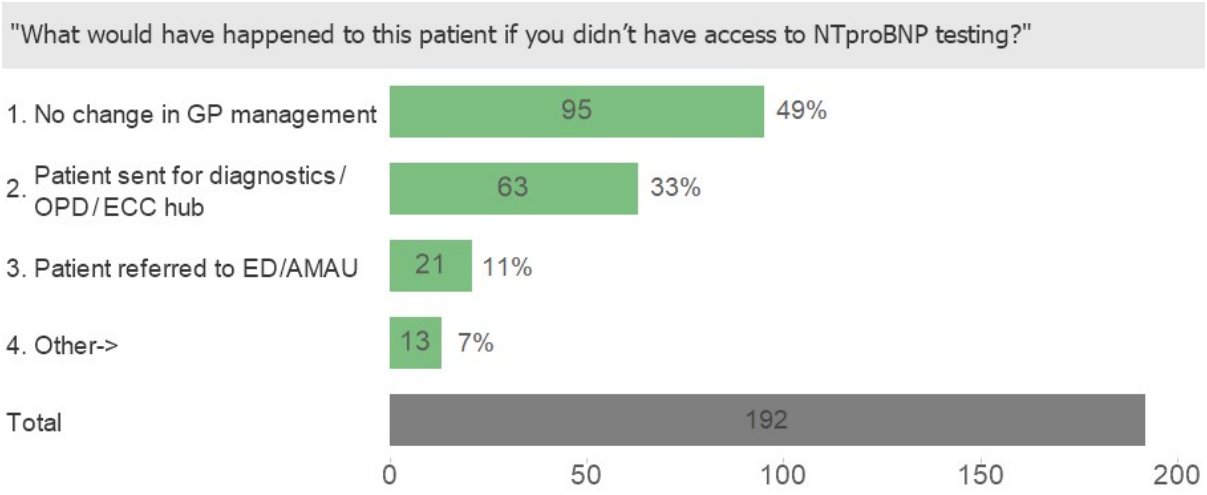

Figure 5- GP assessment of case management without access to NT-proBNP testing

For the 13 cases where GPs recorded "Other" impacts on care, many GPs felt by out-ruling HF, their management was improved, giving more clarity around health problems relevant to each individual patient case, thereby improving patient care, reducing treatment burden on patients and reducing need for primary and secondary care visits.

3.5 Consequences of each NT-proBNP test

Figure 6 shows the summary of what happened to the patients involved in this audit as a result of having their NT-proBNP levels measured. Again, these data were gathered from

GPs undertaking a chart review for each patient.

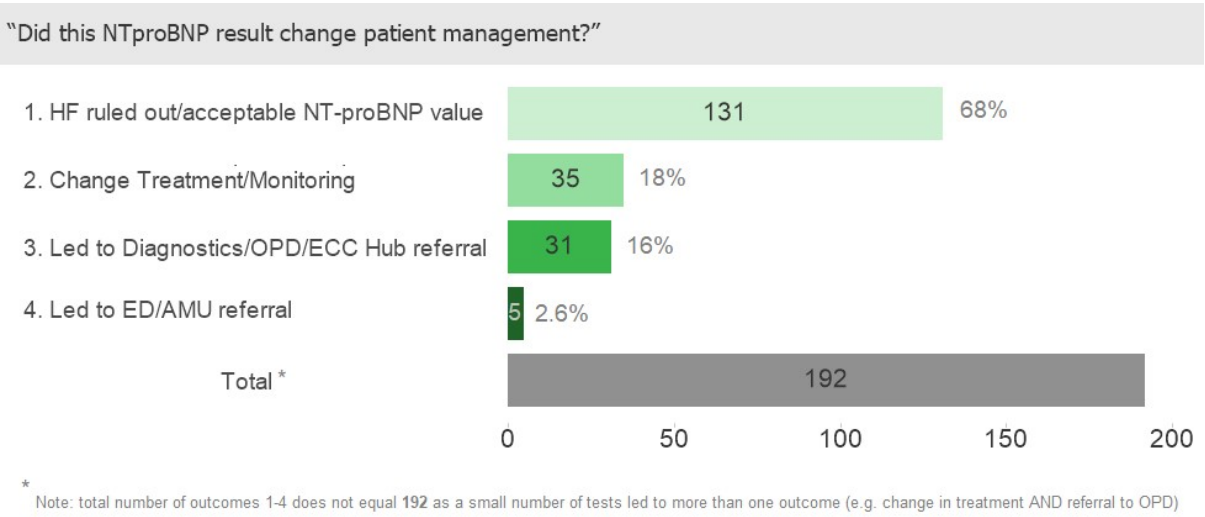

Figure 6- Breakdown of NT-proBNP tests by Clinical Care Impact

Interpreting these data:

- Just over two-thirds (68%) of NT-proBNP results ruled out heart failure or were acceptable to the treating GP based on their knowledge of the patient's history.
- A further 18% of results impacted treatment or monitoring of patients within general practice.
- Sixteen percent of results prompted a referral for echocardiogram, to an outpatient's department or ECC hub.
- Finally, abnormal NT-proBNP results, taken in conjunction with the specific clinical picture, led to 5 (2.6%) emergency department or acute medical unit referrals.

As each test could lead to more than one outcome listed in Figure 6, adding together cases referred to Diagnostics/OPD/ECC hub (16%) and ED/AMU referrals (2.6%), demonstrates that less than 20% of NT-proBNP results led to referral to hospital services.

Thus, more than 80% of test results were managed in GP.

From the light grey section of the "Total" bar in Figure 4 we know that just over 55% of tests were normal, and thus we can say that GPs are interpreting abnormal results within the clinical context i.e. an NT-proBNP result that is above the specified reference range is still often reassuring, depending on the accompanying clinical picture.

3.6 Overall impact of NT-proBNP availability

While Figure 6 demonstrates that 36 (31+5) (19%) patients audited were sent onwards for further investigation or management, it is important to consider how this fits with the previous clinical information obtained in Figure 5.

Figure 7 combines Figures 5 and 6 to yield insights regarding how GPs believe NT-proBNP has changed their management of these particular patients.

In the orange Table inset in Figure 7, we can see there has been a 51% reduction in referrals to diagnostic services, outpatients and ECC hubs for these clinical scenarios, due to the availability of NT-proBNP. While absolute numbers are fewer, the reduction in acute referrals to acute medical assessment units or emergency departments is even greater, at 76%.

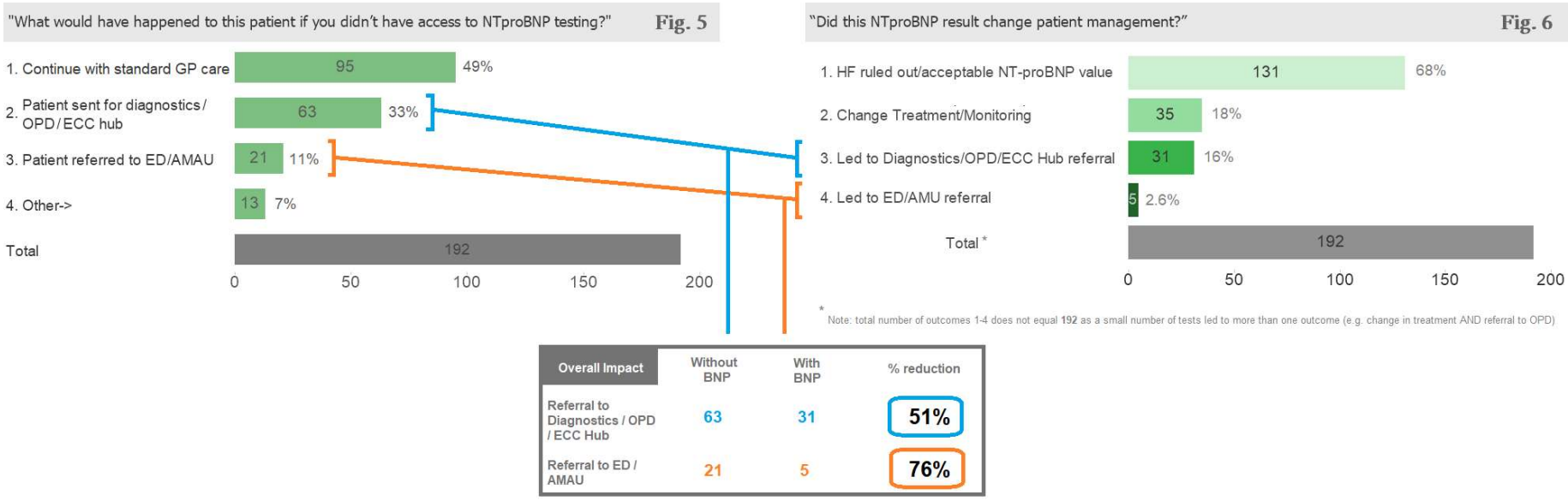

Figure 7- Combining clinical context without NT-proBNP vs with NT-proBNP availability

Table 2 below shows a magnified image of the Table from Figure 7, demonstrating the striking reductions in onward referrals for these patients resulting from the availability of NT-proBNP.

Overall Impact	Without BNP	With BNP	% reduction
Referral to Diagnostics / OPD / ECC Hub	63	31	51%
Referral to ED / AMAU	21	5	76%

Table 2- Overall impact of NT-proBNP on Referral

4. Discussion

The findings of this national audit suggest that NT-proBNP testing is having a beneficial effect on patient care, and that 82% of tests are being ordered within guidelines. Indication for 11% of tests fell outside of current guidelines, with a further 6% of tests being ordered on behalf of hospital-based teams.

From analysis of free text comments, use of NT-proBNP outside of scope typically involved screening of patients with established cardiovascular disease (without a documented history of HF symptoms and/or signs).

Furthermore, more than 80% of NT-proBNP results were managed solely in general practice. This is in the context of 45% of NT-proBNP values being abnormally high. In this audit, 36 (19%) patients were referred to secondary care, which suggests that GPs (appropriately) are managing a majority of patients with abnormal NT-proBNP results within general practice.

While GPs felt they would not have referred 49% of patients for diagnostics or hospital-based care if they did not have access to NT-proBNP, the other half of our sample would have been referred elsewhere (see Figure 5). For the 51% of patients whose management

was significantly impacted by the NT-proBNP result, their referrals for diagnostic imaging, outpatient department care or ECC Hub care were halved, while onward referrals for Emergency department or Acute medical unit care were reduced by 76% (see Figure 7).

Despite these improvements in care, reducing use of NT-proBNP outside of guidelines is a key objective resulting from this audit. Better education of GP teams might include clearer information on which blood tests are required for the CDM programme, in addition to clear indications for NT-proBNP testing, such as those shown below in Table 3:

#	Indication Summary	Description
1	**Suspected new onset heart failure**	A normal result makes HF unlikely. Consider other causes for symptoms.
2	**Existing HF with suspected deterioration**	Not for regular use with every deterioration of HF. Useful in existing HF with multi-morbidity (e.g. COPD) where symptoms of deterioration are similar (dyspnoea). A stable BNP suggests HF is not the cause of the deterioration. A rise of 30-50% suggests that HF is the cause of deterioration.
3	**First registration visit on Chronic Disease Management progamme** (T2DM,AF,IHD)	Raised BNP should firstly prompt a check for symptoms and signs of HF and appropriate management if present. In the absence of clinical features of HF, an elevated BNP should highlight patients at higher risk and prompt us to achieve tighter control of risk factors and to "look under the bonnet" to see if there are any previously undiagnosed issues at play (e.g. ECG to look for AF, ABPM to assess BP control etc.)

Table 2- Suggested information for GP teams on use of NT-proBNP

It is felt that educational measures such as these would be likely to further improve patient care and decrease the volume of inappropriate use of NT-proBNP in general practice.

5. Conclusion

The ECC programme continues to deliver for public patients in Ireland. A large majority of NT-proBNP tests are being ordered by GPs within guidelines, and access to this blood test is ensuring more care of the older patient is remaining in general practice. Nevertheless, use of NT-proBNP within guidelines can be optimised, to ensure judicious use of this important resource and maximising the benefits it can bring to patient care.

Appendix 1

id	Age	Gender	NTpro BNP result	Indication for this NTproBNP sample		What would have happened to this patient if you didn't have access to NTproBNP testing?		Did this NTproBNP result change patient management? (please enter "Y" below for all that apply)						Comments
				Please select reason from dropdown:	Please enter "Other:" reason here	Please select reason from dropdown:	Please enter "Other:" reason here	No impact	Patient/GP reassurance (negative predictive value of test)	Change in therapy or monitoring	Led to referral for diagnostics	Led to referral to ECC Hub	Led to referral to OPD	Led to Referral to ED/AMAU	
1x	66	m	4500	1. Registration visit for CDM programme		4. Other->	may have decompensated				Y				new pick up ? heart failure, referred for ECHO
1y	82	f	120	2. Possible new diagnosis of heart failure		2. Patient referred to outpatients			Y						Leg swelling - patient delighted BNP test in normal range
1z	75	f	250	5. Other->	patient request	1. No change in GP management			Y						patient's sister had BNP test
1q	68	m	50	1. Registration visit for CDM programme		1. No change in GP management		Y							patient has asthma, test not required

Figure 7- Screenshot of Excel data return template file