Run Charts in Quality Improvement.

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Pam Mosedale:

Hi everyone. Welcome to this new episode, part of the Boxset on clinical audit. In earlier episodes, we talked about clinical audits and making changes. Now let's talk about measuring and testing the improvements and changes you've made. So we're very lucky to have Kathrine Blackie to talk to us about this. Kathrine is the Quality Improvement Manager at Linnaeus and she's going to talk to us about how we can use run charts in Quality Improvement. Hi Kathrine.

Kathrine Blackie:

Hi, Pam. Thanks for the introduction. So, as you said, we're going to have a chat about run charts today and learn about how they can help us with our quality improvement. So this diagram you're probably familiar with if you've done anything with the RCVS Knowledge Quality Improvement resources so far. But it shows you the overall picture of all the activities we might be doing within quality improvement. Run charts fit into the clinical audit parts, so right in the centre of this diagram, and they are part of the way we might measure things when we are doing a clinical audit. So that's where they fit in the big picture.

Pam Mosedale:

That's great. I've heard of run charts, but I'm never quite sure exactly what they are and how you do it.

Kathrine Blackie:

Okay, so yeah, what is a run chart? It's, very simply, it's a graph of data plotted over time. So if you are measuring something about the work you are doing in chronological order and plotting it on a graph, as you can see in the example here, the thing you are wanting to measure, you plot that on the vertical axis, the Y axis, and then time goes along the horizontal axis, the X axis, and the time periods you measure on this example here, it's just day by day over a two week period. But you might measure things on a weekly or even a monthly basis.

Pam Mosedale:

Okay, that's really explained it well, thank you. But why would I want to use a run chart?

Kathrine Blackie:

Run charts are a very, very useful tool for quality improvement because what they do is they let us look at our data over time to assess performance. And sometimes just by plotting that data, you can start to see patterns and understand more about what's going on in your system. That can help you to formulate your aims and see where you want to improve, where there's room for improvement. They also let us see whether our changes have actually resulted in an improvement, and then monitor over time to see whether that improvement's been sustained. And perhaps it can give you evidence to show that a change that you are testing has had an impact. That could be useful if it's maybe something that you are thinking you might be able to roll out on a larger scale.

Pam Mosedale:

And how is that different to just measuring something or making a change and measuring it again?

Kathrine Blackie:

Yeah, so often when we are doing some sort of improvement project or a clinical audit, what we do is we measure the thing that we're trying to improve, we make our change and we measure it again. But that can sometimes be a bit misleading, and I'll explain that with an example. So say you work in a normal sort of small animal practice and you've got a bit of a problem, your appointments are always running late. So you decide you're going to do a clinical audit and measure what percentage of your appointments are on time every day, or measure that over a period of time and make a change and measure again. So here we go. That's what it looks like. So before you measured and 'oh, only 28% of your appointments were on time', and then you made your change and you measured again. 'Oh, and now we've got 43% of our appointments on time.' So what do we think about that?

Pam Mosedale:

Great, great successful change.

Kathrine Blackie:

Yeah, absolutely. We've had, you know, what looks like a really great improvement here. Or is it? Looking at how your system changes over time rather than just before and after can actually make things a little bit clearer because determining if improvement has really happened, if it's the result of the change you made and if it lasts, requires you to observe that over a little bit longer time. I realise this slide is a little bit busy and complicated, but just to sort of set the scene, what we've got here is four run charts and they all represent the same thing that we've just seen on that previous graph. A bit of explanation. What we've got is weekly measures of the same thing. How many of... What percentage of your appointments were on time measured weekly for 14 weeks. The red arrow on each one of these run charts represents your before measurement, 28%, and the green arrow on all of them represents your after measurement, 43%, but they're really different looking. So what we need to think about is what do each of these run charts tell us about the change we've put into place? And which one of these would you want to see if this was your clinical audit? So Pam, which one looks good to you at first glance?

Pam Mosedale:

Well, looking at it initially, number two looks good. It's all improving or going up.

Kathrine Blackie:

Well, let's take them one at a time. So in number one there, we've got quite a lot of variation week by week. This chart is going up and down all over the place. And what's happened here is that you have by chance sampled a low point in your before and a high point in your after measure, but it doesn't look like your changes actually made any difference. In number two, which is the one you

were quite keen on, what we're seeing here is that your percentage of appointments on time was actually already improving at quite a nice steady rate before you put your change in place. And that has just carried on. There's no evidence that your change has had any effect in this one either and it probably would've improved regardless.

Pam Mosedale:

Ah, I see. Yes,

Kathrine Blackie:

On to number three, which I think is probably something that would quite commonly happen with improvement initiatives, where you put your change in place, you do see a sudden big improvement in your measure, but then it tails off. That improvement is not sustained over time. In fact, by the time we get to the end of our measurement period there, we're back at the baseline. So this is one of these improvement initiatives that has done really well at the beginning and then just tailed off.

Pam Mosedale:

I've definitely seen a few of those.

Kathrine Blackie:

Yeah, me too. Number four is the one we want. This one shows that after the point that you make the change, you get a really nice improvement and that that improvement is sustained all the way to the end of that measurement period.

Pam Mosedale:

Oh, I understand that. Brilliant

Kathrine Blackie:

Yeah, so that's why run charts give us a lot more detail about what's really happening in the system than a simple before and after. So we'll go on now and talk a little bit more about measurement and what we're trying to achieve here. One common problem is that we tend to think that we are measuring a static system, so like a lily pond, nice and flat and always the same. And for that reason, we need to get as many measurements, as big sample as we possibly can. And that's probably because we are used to hearing that from when people talk about research.

Kathrine Blackie:

But actually, the systems we work in are not static. They're not the same all the time and there's a huge amount of different influences on them. The situation is it's more like a river. It's changing all the time. And what we actually need to understand is the normal variation in our system. Where are the banks of the river? So variation, that's a new word I'm bringing in here. What am I talking about? There are two types really that you're going to see in your systems. The first is what we call common cause variation. This is the variability that's just inherent in the process. It's due to ordinary causes and the normal influences that are going on in your system. That means that you've got a fairly predictable process. It's the random variation that you see. So a day-to-day example would be your daily commute to work. It's not going to take exactly the same number of minutes every morning. There's going to be normal variation in that because the volume of traffic will be different, the weather conditions, maybe setting off at a slightly different time and all of that is going to affect it within a certain time boundary.

Kathrine Blackie:

On the other hand, special cause variation, this is a little bit different. And this is due to your sort of irregular causes that aren't a normal part of your process. This makes the process unpredictable and it's non-random. There is a reason for it. It's otherwise called assignable variation. So using our commuting example, this might be you having a commute that suddenly takes five times as long as it normally would because there's been an accident, and that's held up all the traffic.

Pam Mosedale:

That's a great explanation. I love the analogy, but how do we know what sort of variation we've got in our systems?

Kathrine Blackie:

Yeah, what kind are we looking at? And to that point, why would it matter? I think, when you look at a run chart, there are ways to tell, in particular, it's important to identify when we've got special cause, this non-random type of variation, and there's two main things you might see on your run chart if this is happening in your system. The first one is having a data point that's a massive outlier to all the rest. You can see that in that top example graph there. You've got that one point that's way out of all the others, and that should be giving you a clue that something different has happened on that day that's caused that strange result. The other way you might see it is if you get a shift, so that's like a consistent change in the average values on your run chart. And that's shown on the bottom graph there. So in the first half of that graph, it's sitting along around 15 to 20, and then in the second part, it's sitting around 35. So you've had a big shift there, the red line just represents the average, but you can see that the line has crossed the average line and is sort of sitting comfortably above it. So something has happened there that has caused that change. So why...

Pam Mosedale:

That's... Sorry Kathrine, carry on.

Kathrine Blackie:

No, that's all right. I was just going to try and explain why we want to know about this. And the reason is that, you know if your process is just showing the normal random common cause variation, then when you're looking to improve that system, your strategy should be to change the underlying process, because reacting to all little individual performance changes is just going to increase variability. Whereas if you've got a process where you are seeing this non-random, special cause variation, what you want to do is actually investigate why that's happening. Because changing the whole underlying process on the basis of a special cause would be a waste of resources. So, in order to put that in context, I'll go back to our sort of commuting example. Imagine that you had that day when it took you two hours to get to work because there was an accident. If you were to then use as your improvement strategy, changing the underlying process, and that would mean say allowing two hours to get to work every single morning, that would be a massive waste of your time, because it's not the underlying process that's the problem.

Pam Mosedale:

That's really interesting because I was going to say, I can really relate to that where we...something happens and we almost do a knee-jerk change sometimes, and with not necessarily thinking about other consequences of that change.

Kathrine Blackie:

Yeah, absolutely. And that's another way that run charts can help us because they can also show you if your change has resulted in some sort of unintended consequence that you maybe wouldn't have

thought of. So let's look at the practicalities. How do we actually do this? Well, as I've said, a run chart is a quite simple line graph. You could do this on a piece of paper, all you're doing is gathering your data points in whatever is the appropriate time intervals to do that for the thing you're measuring. Actually, a really good way to do this is to use a bit of technology and put your numbers into an Excel spreadsheet. This will then, you know, there are ways to then automatically create a graph out of that. And you can even add a median line, an average, using a formula in Excel, it's fairly straightforward.

Kathrine Blackie:

I managed to work out how to do it and I'm not the most tech-savvy person. And you can just keep plugging in your data points then over time, and watch that graph update itself. If you want to go really simple, there are actually already templates that you can just plug your numbers into and all the formulas are already done. It will work it out for you. There's a really good one from the Institute for Healthcare Improvement that you can download and use. It's free. You just have to register with them with your email and you can get access to that.

Pam Mosedale:

Excellent. So we all need to go out and try and create run charts then. Sounds great.

Kathrine Blackie:

So, I've sort of thrown together a few examples that we might want to use, but the basic principle is that you've got to think about something that maybe you want to monitor over a long period of time or something that you think there's going to be room for improvement in your practice. Well maybe if you're already planning an improvement initiative or a change and you want to monitor it, then that would be a good place. A few examples could be that maybe you want to track how many procedures you are doing on a daily or weekly basis. You maybe want to look at the percentage of your surgical procedures that end up with a complication. Perhaps you want to monitor your client's waiting times. Or how many dispensing errors you're getting every week. Or maybe you are wanting to improve your pain management in practice, so you want to track the percentage of your surgery patients that got a pain score. Maybe you're looking at maximising your nurse appointments and you're wanting to track how many you're booking every day or week. But actually, the possibilities are endless with this. I hope this sort of, you know, is a few examples of very different things that might get you thinking about where you might use this kind of process in practice.

Pam Mosedale:

No, that sounds really interesting and yeah, I'd be really interested in doing some work, as I know you are, around the number of dispensing errors, so I think that'd be a great way to use the run charts there, and lots of those other examples. So useful for practice and things that if we change them and know why and how these changes are happening, it's going to be really useful. They're going to be practical and useful, aren't they?

Kathrine Blackie:

Definitely. I think it's very easy to get bogged down and think this is super complicated, but I hope I've shown you that it really isn't. It's very straightforward. It's just, you know, putting a number onto a chart every week, maybe, and just monitoring your progress.

Pam Mosedale:

No, you absolutely have, because I've always found run charts very complicated and when people start talking about math-type things, it really turns me off I'm afraid. But no, you've made that so

easy to follow, that's brilliant and I hope it's an inspiration to practices out there to start using run charts. And you've got practices that are doing this, have you in your group?

Kathrine Blackie:

Yeah, definitely. So we've got a couple of initiatives on the go. Tracking surgical site infections is one thing that we are monitoring on a monthly basis over time, and that's starting to yield some very good results. That's one of our examples.

Pam Mosedale:

Excellent. We'll wait to see some published results from that then because it's good to share these things, isn't it too?

Kathrine Blackie:

Yeah. So on that note, I'll just wrap up with a few little tips to just sort of sum up everything we've said. The first one is, to think about what do you actually want to understand better about your system and then pick something that's fairly easy to measure. If it's really complicated to gather your data, you're not going to keep it up. It's going to become too difficult and too time-consuming. Try, if you possibly can, to get a bit of baseline data, four to six measurements before you put a change into place. That way, you'll really know where you're starting from and to have very good evidence that your change is the thing that has created the improvement.

Kathrine Blackie:

And remember our lily pond and river, keep your changes small, and measure often. You don't need massive samples of data each time. And then the last one, as you've already said, Pam, make sure you share your findings. Share what you found out with your practice and then, if you possibly can, share it more widely. Yeah, a bit of a plug, but you can always apply for a Quality Improvement award from RCVS Knowledge. And that's a great way to share what you've done and inspire other people to do the same thing.

Pam Mosedale:

Thanks for the plug, Kathrine. And yes, absolutely that would be a great thing to do because then it'll be there as a case example to help other people. And yes, small and measure often. I mean, I think this is the principle of all Quality Improvement, bite-size is really good, isn't it? Making little changes.

Kathrine Blackie:

Yeah. Yeah. I think that's the thing is, you know, hammering home that difference between Quality Improvement measurement and research measurement, you are not trying to do a research project. You're just trying to make those little improvements in practice and make this part of what you do day to day.

Pam Mosedale:

Absolutely. Oh, thank you. No, that's been amazing. Thank you so much for your time, Kathrine, and I'm sure everyone will find this really useful. Thank you.

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